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Consulting
Engineering
Geologists and
Hydrogeologists

Toronto-Buttonville Airport ■ Markham, Ontario ■ L3P 3J9 ■ 416-477-8400

BURLINGTON LANDFILL
1981 MONITORING PROGRAM
FOR
THE REGIONAL MUNICIPALITY OF HALTON

PROJECT NO: 80-96-B

SEPTEMBER, 1982

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Consulting Engineering Geologists and Hydrogeologists

Toronto-Buttonville Airport ■ Markham, Ontario ■ L3P 3J9 ■ 416-477-8400

September 21, 1982.

The Regional Municipality of Halton,
1151 Bronte Road,
Oakville, Ontario.
L6J 4Z3.

Attention: Mr. D.J. Corbett, P.Eng.

Dear Sirs:

Re: Burlington Landfill, 1981 Monitoring Report
GLAL 80-96-B

We respectfully submit the Burlington Landfill 1981 Monitoring Final Report.

Thank you for allowing us to be of service and if you have any questions please contact my office.

Yours very truly,
GARTNER LEE ASSOCIATES LIMITED

Grant Anderson

E.G. Anderson, P.Eng.,
Consulting Hydrogeologist.

RCD:dg

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1.0 CONCLUSIONS AND RECOMMENDATIONS:

1.1 CONCLUSIONS:

Based on the findings of the 1981 monitoring program the following conclusions are drawn.

- The landfill has minimal impact on local ground water due to
  a) the slow ground water flow rates
  b) the naturally mineralized (poor quality) "background" ground water which occurs in the shale bedrock underlying the site
  c) the lack of any ground water usages in the area downgradient of the landfill

- The toe-drain which was installed around the south perimeter of the landfill in 1979-1980 has been successful in greatly reducing leachate discharges from springs along the toe of the landfill. Preliminary flow measurements suggest that the system collects in the order of 48,000 m^3/year of leachate which is discharged to the Burlington sanitary sewer system.

- The actual distance and depth to which leachate has migrated appears to be less than we originally indicated in our 1080 monitoring report. The occurrence of naturally saline water and resultant interferences in chemical analysis has complicated data interpretation. The presence of saline water does however indicate very slow ground water flow rates in the shale bedrock, and the lack of any potential ground water supply resource in the immediate area.

- Surface water quality data shows no detectable impact on Falcon Creek from the landfill. We do not anticipate any significant impact in the future providing that the toe-drain is extended as planned and surface runoff from the working face is minimized. The Indian Creek tributary channel adjacent to the landfill was not flowing during site visits and hence was not sampled.

1.2 RECOMMENDATIONS:

Based on the findings of this study we recommend that the monitoring program be continued but ground water sampling be reduced in frequency from twice a year to once a year. The following tasks will be completed during the 1982 monitoring program

a) Four times per year
   - Sample 3 surface water stations on Falcon Creek
   - Measure ground water elevations in all monitors
   - Sample leachate from the toe drain collection system

b) Once per year
   - Sample and analyze ground water quality in the monitors listed in Table 1. All monitors will be redeveloped prior to sampling

c) The monitoring parameters will remain the same as November 1982 (see Appendix II)

d) Complete any work required to repair existing monitors

e) Flow measurements from Falcon Creek and the leachate collection system will be interpreted with climatic data to assess seasonal trends

TABLE: 1

PROPOSED 1982 MONITORING STATIONS

Surface Water - (4 times annually)

Falcon Creek	SW1, SW2, SW3
Indian Creek	sites to be established if flow is encountered during field checks.

Ground Water - (once annually)

BH1-I,	1-II		
BH2-I,	2-II		
BH6-I,	6-II		
BH7-I,	7-II,	7-III	
BH10-I,	10-II,	10-III	
BH12-I,	12-II,	12-III	
BH13-I,	13-II		
BH14-I,	14-II		
BH15-I,	15-II		
BH16-I,	16-II,	16-III,	16-IIII
BH17-I,	17-II,	17-III,	17-IIII

Leachate - (4 times annually)
- Manhole on toe-drain downgradient of landfill

2.0 INTRODUCTION:

Gartner Lee Associates Limited were retained on August 13, 1980 by the Regional Municipality of Halton to carry out a monitoring program at the Burlington Regional Landfill. This program was required by the Ministry of the Environment as part of their provisional certificate of approval No. A210102. This is the second annual monitoring report on data collected at this site. The monitoring program is ongoing as per the recommendations in this report.

Ground water and surface water monitoring was carried out. The ground water program was designed to assess not only the impact of the existing and expanded landfills on the ground water quality, but also to document possible off-site movement of the contaminant plume.

The purpose of the surface water monitoring program was to assess the impact of landfill site operations on the water quality of Falcon Creek, and to determine the effectiveness of the toe-drain collection system in preventing overland leachate flow to the creek.

A considerable amount of hydrogeological work has already been done at this site. Previous reports were reviewed and pertinent data and interpretations are included in this report. For a more detailed analysis of the hydrogeological setting please refer to the October, 1979, Burlington Landfill Site, Hydrogeological Study by Gartner Lee Associates Limited in conjunction with M.M. Dillon Limited.

The previous annual monitoring report was entitled "Burlington Landfill Site, Monitoring Program - Interim Report, April, 1981.

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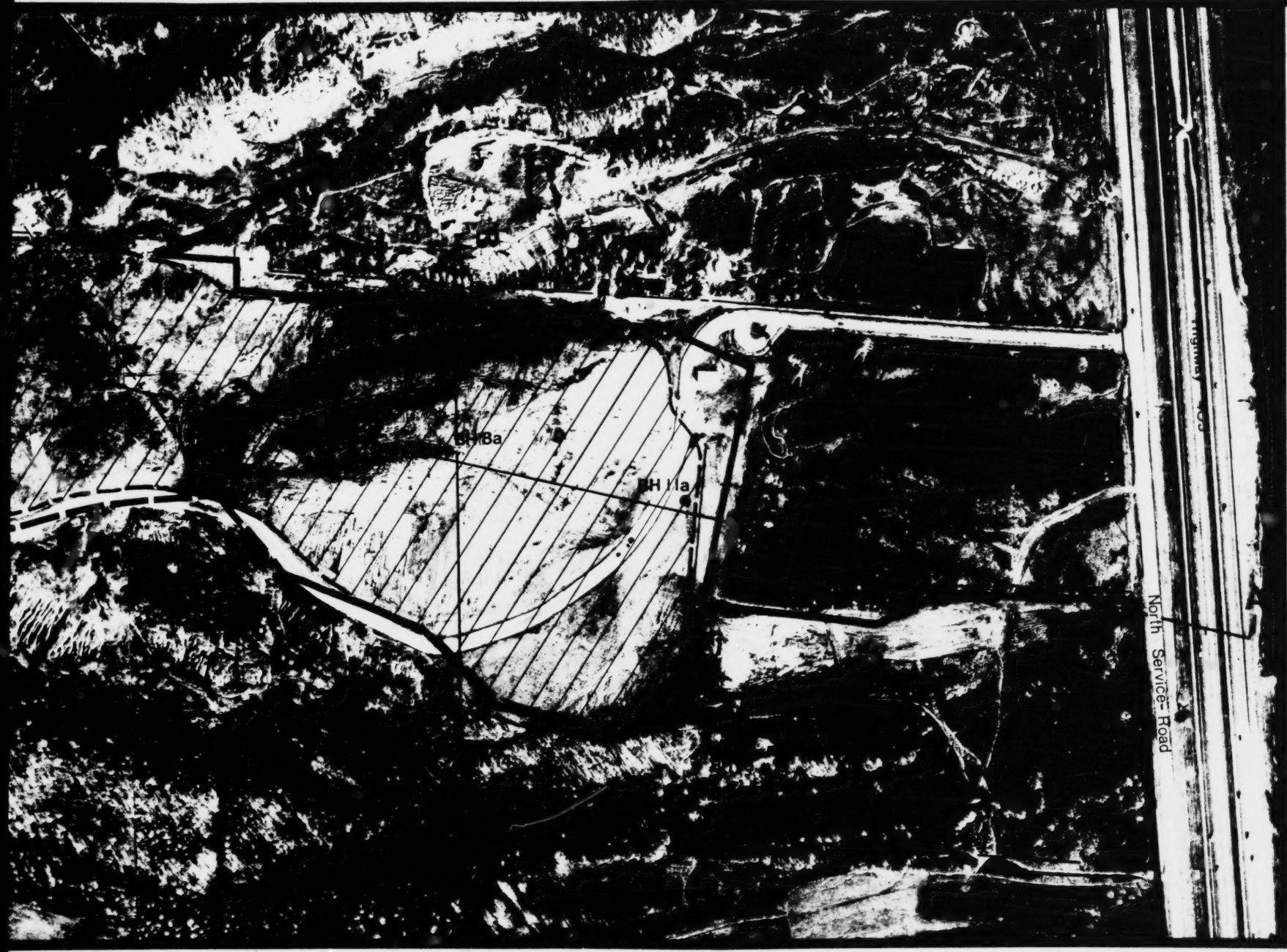

Legend

Fig. 1

- ● BH 5 Gartner Lee Borehole Location And Designation
- Streams (Intermittent)
- Refuse
- Expansion Area
- Existing Toe Drain
- Proposed Toe Drain
- ▲ SW 3 Surface Water Monitoring Station
- A — A' Cross-Section
- Property Boundary

0 100 200
METRES

Approximately 1cm= 33m

Site Plan

HALTON REGION
BURLINGTON LANDFILL SITE

Project 80-96

Gartner Lee Associates Limited

3.0 PROCEDURES:

Ground water samples were collected on April 8th and November 23, 1981 from monitors installed by Gartner Lee Associates between 1978 and 1980. The monitor locations are shown on Figure 1. Samples were collected with a stainless steel bailer or a vacuum pump.

Surface water samples were collected on April 8, May 21, October 20 and November 23, 1981, from 3 locations on Falcon Creek (see Figure 1). Samples were not collected from Indian Creek adjacent to the east side of the landfill because there was no flowing water during site visits. Ground water elevations were measured and surface water flows were estimated during all four monitoring trips. A v-notch weir staff gauging station has been designed to refine stream flow measurements on Falcon Creek. Construction of the weir should be completed in 1982.

All water samples were placed in MOE approved glass bottles and delivered to the MOE laboratory for analysis the same day they were collected.

Observations of general site conditions and leachate springs were made during site visits. Monitors at BH3, BH4 and BH5 were sealed and destroyed during excavation of the expansion area to the north. Monitors BH10 and BH6 have been damaged by heavy equipment or vandalism and will be repaired during 1982. The upper seals have caved on BH1 and BH17 and must also be repaired.

4.0 RESULTS AND DISCUSSION:

4.1 BACKGROUND:

Regionally the subject lands are situated on the lower slopes of the Niagara Escarpment in an area heavily dissected by gullies and ravines. The lands comprising the site slope moderately towards the south and east, except as altered by the existing fills. A deep ravine, eroded into the shale bedrock, borders the western periphery of the site. In places, along the east slope of this ravine, erosional gullies occur. Falcon Creek flows intermittently to the south along the ravine bottom.

A less pronounced ravine borders the east side of the expansion area. Intermittent drainage channels to the east of the property are part of the Indian Creek drainage basin.

The northern portion of the site is mantled by a relatively dense to very dense clayey silt till. A maximum till thickness of 12.5 m occurs in the vicinity of BH 1, but this till is absent in the southern part of the site. A layer of weathered Queenston shale, varying in thickness up to 5.2 m occurs beneath the till in the northern part of the subject area and at surface in the south. Unweathered Queenston shale forms the bedrock base and it is reported to be about 180 m thick.

Previous reports have indicated that methane gas from the landfill migrates less than 5 metres in the dense till

soils and shale bedrock. Since these geologic materials severely retard lateral gas migration and there are no buildings nearby, no conventional gas monitoring is required at this time.

4.2 GROUND WATER:

All ground water elevations taken to date are appended along with two representative hydrographs. Borehole locations are shown on the site plan Figure 1 and a map of the water table configuration in October 1980 is presented on Figure 2. A 1981 water table map is not included because we have less data points than in 1980 (three monitors were destroyed in the expansion area) and the map would be very similar.

Ground water flow is generally to the south with western components of flow towards Falcon Creek. Downward gradients were measured on the landfill and in the upland areas, indicating downward flow (recharge) as well as lateral flow. Along the flood plain of Falcon Creek and near the North Service Road the vertical gradients are very small indicating primarily lateral ground water movement. Ground water velocities range from 1 to 15 metres per year depending on local variations in hydraulic gradient and the permeability of the till and shale. Lateral flow through the saturated refuse at the base of the landfill is likely much faster but this flow is intercepted by the toe-drain leachate collection system. Figure 3 shows the ground water flow system in cross-section.

There is no recorded ground water use in the immediate vicinity of the Burlington Landfill Site. The lands to the east are vacant and Highway 403 crosses south of the site. The property immediately south of Highway 403 is an undeveloped Canadian National Railway corridor. The industries located west of the landfill along the North

Dry
128-9

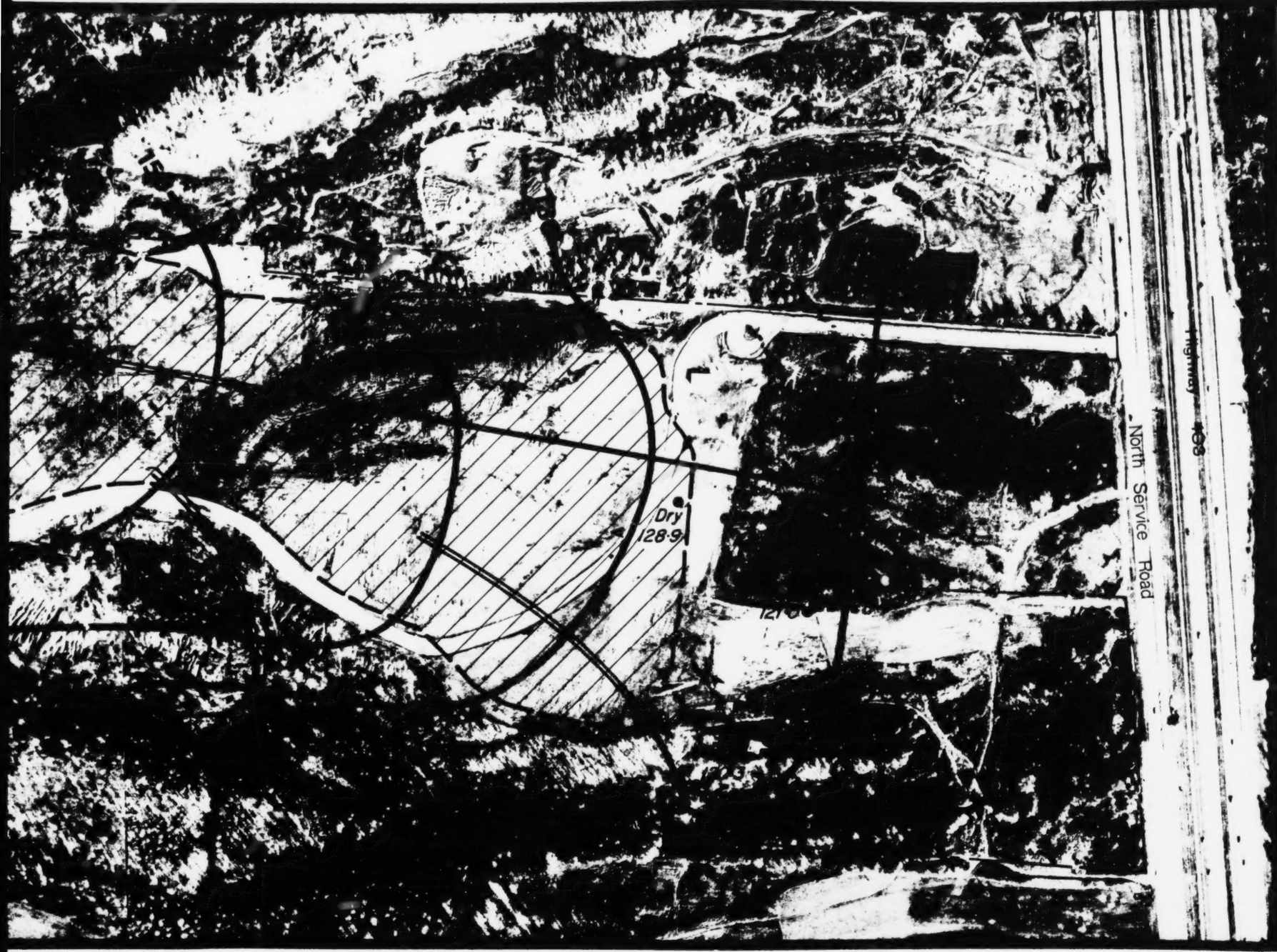

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Fig. 2

- ●119·3 Observation Point & Water Table Elevation (Oct. 1980)
- 130 Inferred Ground Water Table Contour (Oct. 1980)
- Probable Shallow Ground Water Flow Direction
- Ground Water Divide
- Streams
- Refuse
- Property Boundary

0 100 200
METRES

Approximately 1cm. = 33m.

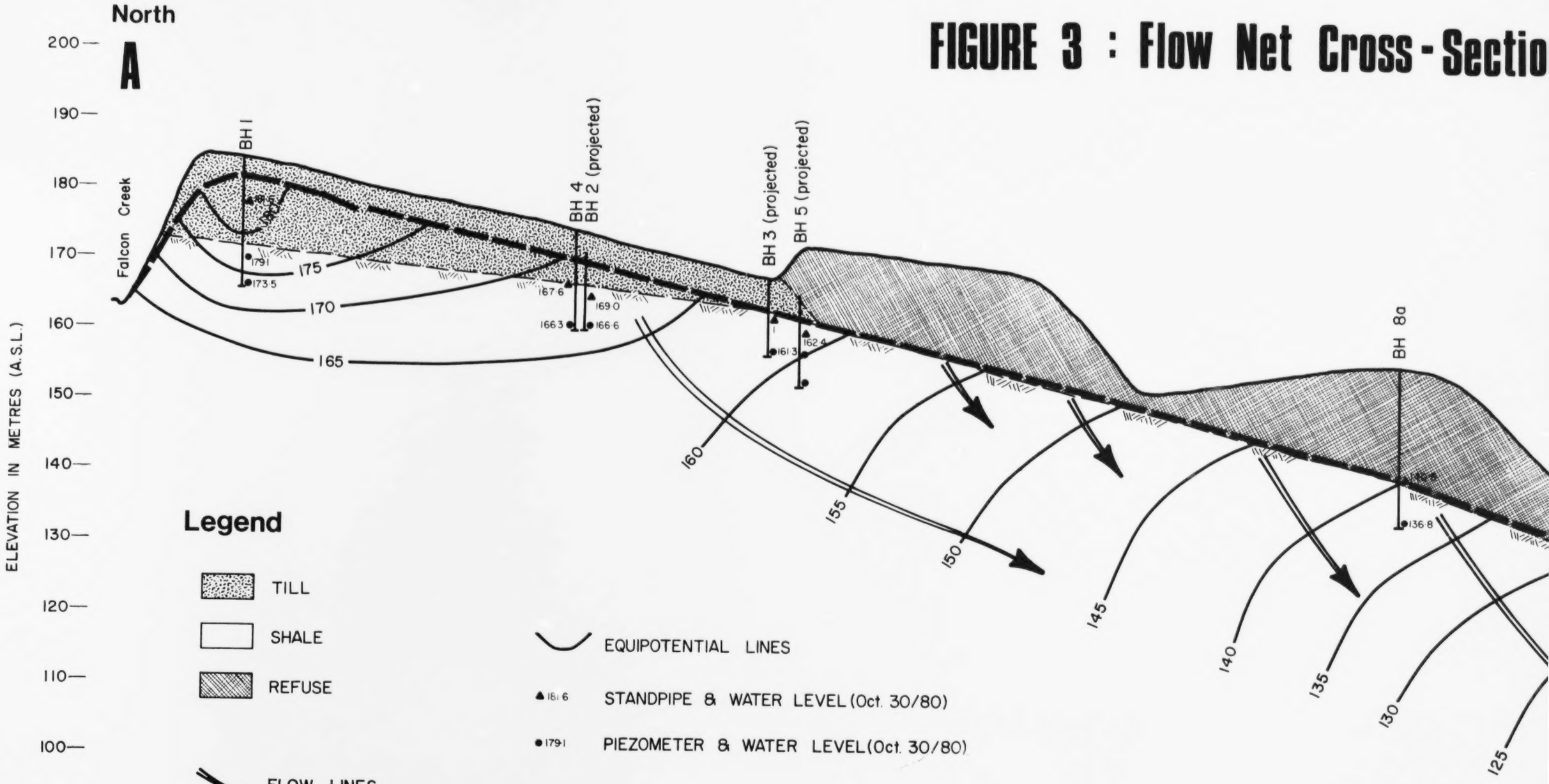
Water Table Configuration

HALTON REGION
BURLINGTON LANDFILL SITE

Project 80-96

Gartner Lee Associates Limited

FIGURE 3 : Flow Net Cross-Sectio



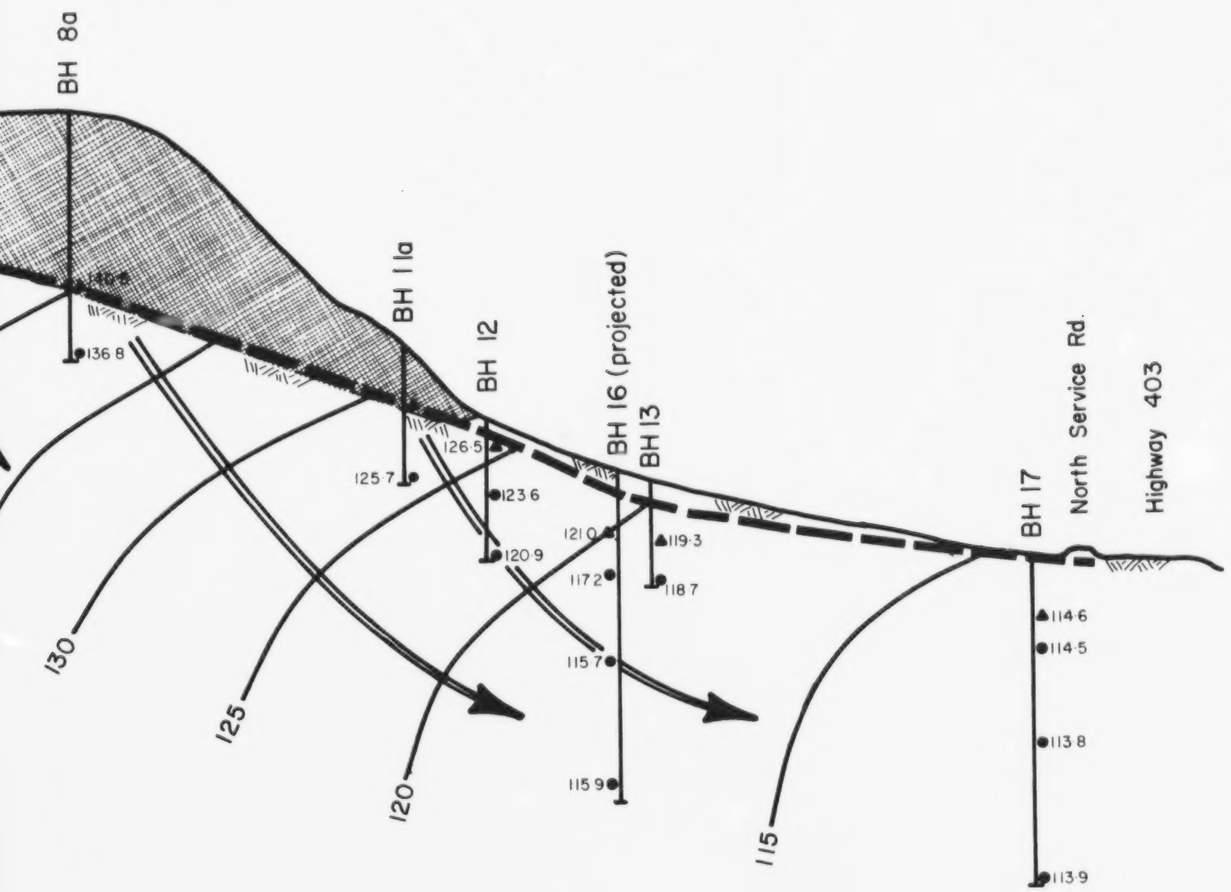
oss - Sections A·A' & B·B'

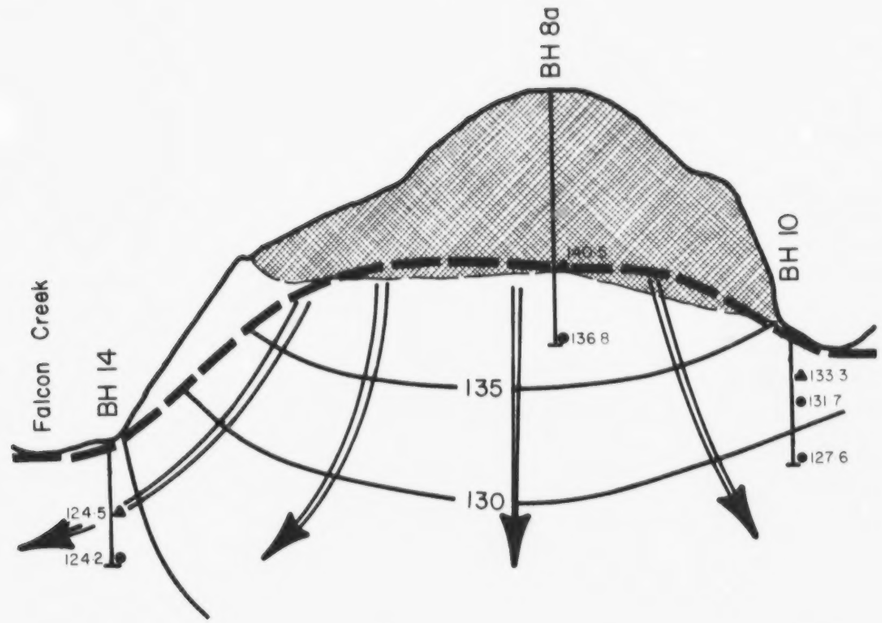
South — West

A' — B

East

B'





Service Road are serviced with city water from Lake Ontario.

All ground water quality analyses done to date are presented in Appendix 2. A number of additional parameters were analyzed during the 1981 monitoring program which have assisted our interpretation of ground water quality at this site. Table 2 summarizes ground water quality by presenting the concentration ranges of "background" ground water, "deep saline" ground water and "raw leachate".

The "background" water quality is represented by analyses of samples from monitors 1-I, 1-II, 2-I and 2-II which are upgradient of the landfill. These monitors range from 7 to 18 metres in depth. Background water quality is generally poor and deteriorates rapidly with depth. High levels of calcium, sodium, sulphate and chloride occur in the deepest samples.

Table 2 also shows the concentration ranges of "raw leachate" samples collected from two standpipes (8A-II and 11A-II) which are screened in the refuse and one sample from the leachate collection system. The raw leachate has elevated concentrations of many organic and inorganic parameters, is typical of southern Ontario landfill leachate. The leachate is of poor quality relative to drinking water standards but the concentration ranges for many leachate parameters are less than or equal to the ranges of "background" ground water.

TABLE: 2

Concentration Ranges of "Background" Ground Water, "Deep Saline" Ground Water and "Raw" Leachate

	Upgradient Background Ground Water	Deep Saline Ground Water	Raw Leachate (8A-II, 11A-II)
Conductance	1500-6000	15,000-57,000	3000-8000
Chloride	5-250	5,000-27,000	500-900
Sulphate	400-3900	350-2,200	40-800
Alkalinity ($CaCO_3$)	500-700	50-300	700-900
Hardness ($CaCO_3$)	700-2000	4,000-17,000	1200-1700
Calcium	50-400	1,000-5,000	250-400
Magnesium	100-200	200-1,300	100-200
Sodium	50-700	2,000-9,000	200-500
Potassium	10-50	80-500	20-30
Iron	1-30	1-20	300-500
Total Kjeldahl Nitrogen(N)	.5-8	1-16	5-300
Ammonia (N)	<.1-3	.5-35	.3-250
Total Phosphorous	.1-.5	.1-.5	1.0-10
Chemical Oxygen Demand	15-50	100-800	170-5200
Biochemical Oxygen Demand	1-30	1-10	30-300

The concentration ranges for samples from monitors 13-I, 16-II, 16-III and 17-I, are presented in table 2 under the column entitled deep saline ground water. In our 1980 report monitors 13-I, 16-II and 16-III were interpreted to be affected by leachate because of their high chlorides and chemical oxygen demands. The additional parameters analyzed in 1982 have resulted in a revised interpretation.

The chloride concentrations in these wells greatly exceed the concentrations in raw leachate which suggest they may be due to natural mineralization rather than leachate contamination. Literature research and discussions with the MOE have revealed that high levels of chloride cause a positive interference with chemical oxygen demand analyses. Similarly the high calcium levels present interferes with total Kjeldahl nitrogen and ammonia analyses. Hence the elevated concentrations of COD, TKN and ammonia reported for the "deep saline" ground waters are probably not true and therefore are not reliable indicators of leachate contamination at this site.

The area immediately downgradient from the landfill is used during the winter to dump snow removed from city streets in Halton Region. This snow is mixed with road salt and will probably cause shallow ground water to have abnormally high levels of sodium and chloride, which also complicates our interpretation of the extent of leachate contamination.

Concentrations of hardness, chlorides and sulphates increased dramatically in monitor 17-I. This monitor is nearly 30 metres deep and is located about 350 metres downgradient

from the landfill. The increase in salinity is not likely, due to a breakthrough of the leachate plume but is more likely just naturally mineralized ground water entering the well. It appears that this deep well was insufficiently developed prior to sampling and the ground water flow rates were too slow to flush out fresh water which was injected during drilling in October 1980. All wells will be re-developed prior to sampling in 1982.

In summary it appears that the leachate plume has not moved as far or as deep as originally thought. The landfill has very minimal impact on ground water at this site due to the naturally poor ground water quality, slow ground water flow rates and lack of ground water usages in the area.

4.3 Surface Water:

Water quality and bacteriological analyses for the three sampling locations on Falcon Creek (see Figure 1) are presented in Appendix II. Stream flows which were estimated during sample collection are also appended.

Figures 4 and 5 show the 1981 mean concentrations of various constituents at the Falcon Creek surface water station. Station SW1 is upstream of the landfill and represents background water quality. SW2 is adjacent to the landfill and SW3 is downstream from the landfill just north of the north service road. Most of the inorganic concentrations stay about the same as the creek flows past the landfill. COD and BOD show a slight increase at SW2 but the stream recovers before it reaches SW3. Only total coliform bacteria shows a significant increase as the stream passes the landfill. The October 20th sample from SW3 had 10,900 counts/100 ml exceeding both the upstream levels of total coliforms (SW1 - 2,000 counts/100 mls) and the MOE recommended limit of less than 1000 counts/100 ml. It is not known whether this level is directly attributable to the landfill or is due to another contaminant source.

The mean total phosphorous concentrations slightly exceed the MOE objective of .03 mg/L to prevent excessive plant growth in rivers and streams in all three stations. The levels at the upstre m station are generally higher than downstream.

Based on the data collected in this monitoring program

it does not appear that any significant degradation of water quality in Falcon Creek is attributable to the landfill site.

Attempts were made to sample the Indian Creek tributary channel adjacent to the east side of the landfill. The stream was not flowing during site visits and hence was not sampled.

FIGURE 4 . Surface Water Quality - 1981 Mean Values

Concentrations in mg/L unless otherwise noted

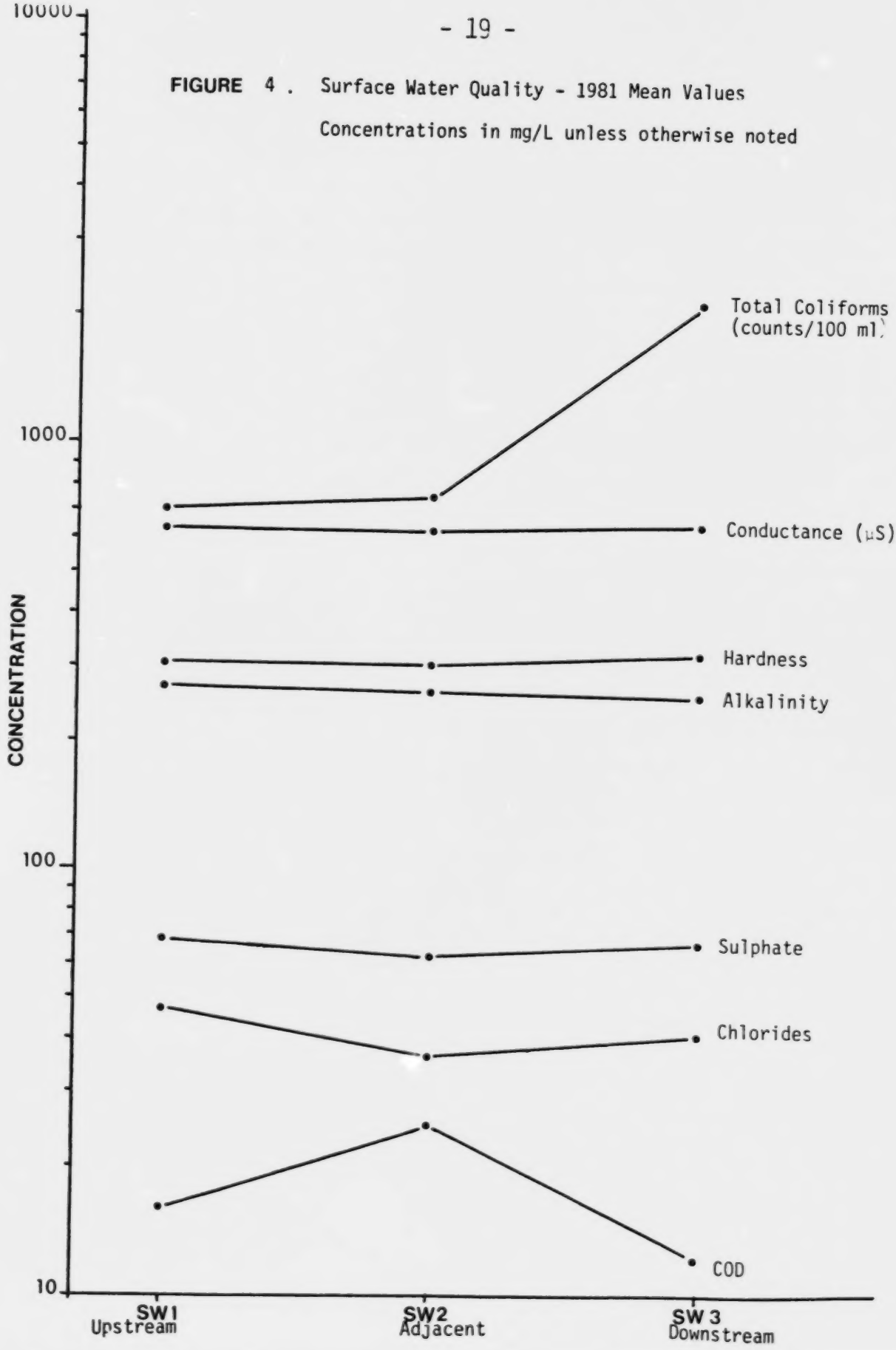
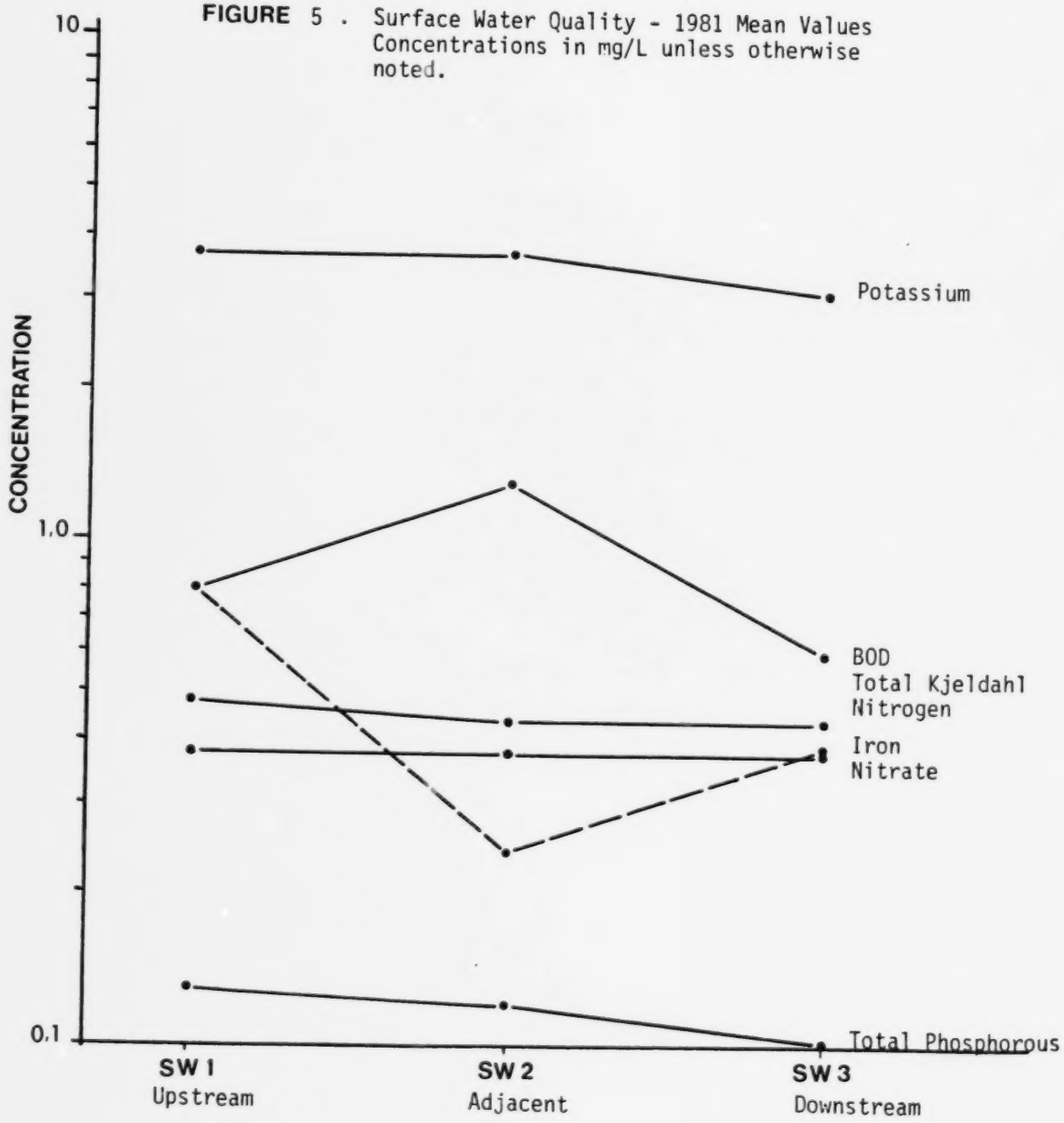


FIGURE 5 . Surface Water Quality - 1981 Mean Values Concentrations in mg/L unless otherwise noted.



4.4 Leachate Collection System:

A toe-drain leachate collection system connected to the Burlington sanitary sewer system was installed in 1979-1980 along the perimeter of the existing fill at the south end of the property. The purpose of this toe-drain is to eliminate leachate springs which used to discharge along the toe at the landfill. Visual ground checks for leachate springs during 1980 and 1981 field visits indicate that the toe-drain has been successful in reducing the number of leachate springs at this site.

A flow meter has been installed on the toe-drain down-gradient of the landfill. Only limited flow data has been collected to date due to calibration problems and unreliable readings caused by scum in the partial flume. Sporadic data from February 23, 1982 to March 19, 1982 indicated that flows generally range from 0 to 50 Igpm. Average flows were about 20 Igpm which works out to 47,788 m^3/year, and correlates reasonably well with the theoretical leachate production calculations presented below. When additional flow data is available a more accurate annual leachate production rate will be calculated and seasonal flow trends will be correlated with precipitation data.

A water budget was prepared for a previous report, based on 20 year normal weather data obtained from the Burlington Climatological Station. The potential evapotranspiration was calculated using the Thornthwaite Method. Following is a summary of the results.

Average Annual Total Precipitation	-	76.1 cm
Average Annual Potential Evapotranspiration	-	62.5 cm
Potential Water Surplus	-	13.6 cm

In this area the actual evapotranspiration is about 10 cm less than the potential calculated by the Thornthwaite Method. Thus, the actual annual water surplus available for infiltration and run-off is about 23.5 cm on the average.

During the operation of the landfill, precipitation is lost through run-off and evaporation, and the remainder infiltrates. It is estimated that the infiltration rate may be about 30 cm per year or 5.7 litres per minute per hectare which equates to 53,926 m^3/year for the approximately 18 hectares of fill. Once the site is closed, finally covered and vegetated, the infiltration rate should be about 10 cm per year or 1.9 litres per minute per hectare which equates to 17,975 m^3/year for the filled area.

Respectfully Submitted
GARTNER LEE ASSOCIATES LIMITED

E.G. Anderson, P.Eng.
Consulting Hydrogeologist

R.C. Dickin, B.Sc., M.Sc.
Hydrogeochemist

RCD:dg

APPENDIX I

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance 'N' - The number of blows required to advance a standard split spoon sampler 30 cm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 75 cm.

Dynamic Penetration Resistance - The number of blows required to advance a 5 cm, 60 degree cone, fitted to the end of drill rods, 30 cm into the subsoil, the driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described as follows:

Consistency	'N' Blows / .3 m	Denseness	'N' Blows / .3 m
Very Soft	0-2	Very Loose	0-4
Soft	2-4	Loose	4-10
Firm	4-8	Compact	10-30
Stiff	8-15	Dense	30-50
Very Stiff	15-30	Very Dense	> 50
Hard	> 30		

W.T.P.L. - Wetter than Plastic Limit
D.T.P.L. - Drier than Plastic Limit
A.P.L. - About Plastic Limit

DESCRIPTION OF ROCK

$$\% \text{ Recovery} = \frac{\text{Total Length of Core Recovered/Run}}{\text{Total Length of Drilling Run}} \times 100$$

BOREHOLE LOGS

BOREHOLE NO. 1

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 23, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. Hollow Stem Augers NX Rock Core — GEOLOGIST A.B.

ELEVATION 183.4 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till becoming grey brown at 9.1 m hard, A.P.L. Fractures to 6.4 m becoming W.T.P.L. at depth	SS	70	13			Sample 3.8-4.6 m 6% gravel 10% sand 48% silt 36% clay
			SS	33	17		▲	
			SS	30				
			SS	60	11			
			SS	92				
12.5		SHALE: Red and green crypto-crystalline, massive bedded shale: weathered, with mud seams to 15.2 m					●	
			NX			70		
			NX			70		
			NX			100		
18.3		Borehole terminated at 18.3 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

TYPE OF SAMPLE.

SS	-	Split Spoon
AS	-	Auger Sample
ST	-	Shelby Tube Sample
NX	-	Rock Core 56 mm ø

SYMBOLS

▲	-	Water Table Monitor (Standpipe Tip)
●	-	Piezometer Tip
	-	Water Level
	-	Piezometric Head

BOREHOLE NO. 6

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 17, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 173.7 — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till, D.T.P.L. hard, fractures to 2.0 m seepage at 3.4 m becoming grey brown at 6.1 m	SS	89	10			
			SS	81	9			
			SS	60	13			Sample #4 1% gravel 8% sand 47% silt 44% clay
			SS	47	15			
7.8		SHALE: Red, with green bands and green mottling, cryptocrystalline, massive to thick bedded shale minor fracturing at an angle to the core	NX			100		
			NX			100	▲	
			NX			100		
16.9		Borehole terminated at 16.9 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 2

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 16, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS, NX ROCK CORE — **GEOLOGIST** A.B.

ELEVATION 171.2 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Red brown clayey silt till, D.T.P.L. hard, minor vertical fracturing to 4.6 m	SS	61	13			
			SS	65	7			
4.6		SHALE: Red with green bands and green mottling, cryptocrystalline massive to thick bedded shale soft, fracturing at an angle to the core, green bands are hard.	NX			100	▲	
			NX			100		
11.0		Borehole terminated at 11.0 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 8A

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 8, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION 155.8 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		FILL: Red brown clayey silt fill, stones, moist						- borehole is back-filled with gravel from 15.80 m to 0.61 m - standpipe is slotted from 15.80 to 0.61 m
1.8		GARBAGE: Alternate layers of garbage and earth fill, moist - saturated at 11.6 m.						
15.8		SHALE: Red brown shale with green layers					▲	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 7

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 22, 1979

BOREHOLE TYPE BOMBADIER 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 181.1 m — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
		TILL: Medium brown clayey silt till with fractures to 6.4 m, becoming grey brown from 7.6 m hard D.T.P.L.	SS	77	12			
			SS	89	11			
			SS	60	9		▲	
			SS	52	13			
			SS	111	8			
			SS	126	5		●	
10.7		SHALE: Red with green bands and green mottling, cryptocrystalline, thin to medium bedded shale weathered and odd mud seams to 12.2 m	NX			100		
			NX			100	●	
15.2		Borehole terminated at 15.2 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 8A (cont'd)

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 8, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION 155.8 m (Ground) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
22.4		Borehole terminated at 22.4 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 10

PROJECT NAME BURLINGTON LANDFILL SITE — **PROJECT NO.** 78-92

CLIENT M.M. DILLON LIMITED — **DATE** JANUARY 30, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS — **GEOLOGIST** A.B.

ELEVATION 134.5 m — **TECHNOLOGIST**

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		FILL: Red brown silty clay fill, D.T.P.L.						
1.0		WEATHERED SHALE						
2.4		SHALE: Red with green bands, cryptocrystalline shale, green bands are hard					▲	
							●	
							●	
12.2		Borehole terminated at 12.2 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 11A

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 9, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — GEOLOGIST A.B.

ELEVATION 134.3 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		FILL: Red brown clayey silt fill, moist						- borehole is back-filled with gravel from 5.33 m to 0.61 m.
2.8		GARBAGE: Garbage mixed with clayey silt and sand, saturated at 4.6 m.					▲	- standpipe is slotted from 5.33 m to 0.61 m.
6.1		SHALE: Red brown shale with green layers						
12.2		Borehole terminated at 12.2 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 12

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 29, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 127.4 m — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.1		TOPSOIL						
		WEATHERED SHALE: Red brown weathered shale D.T.P.L.						
			SS	32	11		▲	
3.4		hard						
		SHALE: Red and green bands, cryptocrystalline, thick to massive bedded shale vugs and gypsum nodules throughout						
			NX			100		
			NX			100	●	
			NX			100		
			NX			100		
12.2							●	
		Borehole terminated at 12.2 m						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 13

PROJECT NAME BURLINGTON LANDFILL SITE — PROJECT NO. 78-92

CLIENT M.M. DILLON LIMITED — DATE JANUARY 29, 1979

BOREHOLE TYPE BOMBADIER, 0.1 m I.D. HOLLOW STEM AUGERS NX ROCK CORE — GEOLOGIST A.B.

ELEVATION 122.0 — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.1		TOPSOIL						
		WEATHERED SHALE: Red brown weathered shale D.T.P.L. saturated from 1.8 m.						
2.4		SHALE: Red, with green bands and green mottling, crypto-crystalline, massive bedded shale	NX			100	▲	
			NX			100		
9.1		Borehole terminated at 9.1 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 14

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 10, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — GEOLOGIST A.B.

ELEVATION 125.27 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL						
1.4		WEATHERED SHALE: Red brown weathered shale D.T.P.L.						
		SHALE: Red brown shale with green layers					▲	- borehole is back-filled with gravel from 5.64 m to 0.61 m. - standpipe is slotted from 5.64 m to 0.61 m.
10.7		Borehole terminated at 10.7 m in shale					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 15

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 10, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS — GEOLOGIST A.B.

ELEVATION 121.0 m (Ground) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.2		TOPSOIL:						
		WEATHERED SHALE: Red brown weathered shale, D.T.P.L.						
		SHALE: Red brown shale with green layers.						- borehole is back-filled with gravel from 5.27 m to 0.61 m.
							▲	- standpipe is slotted from 5.27 m to 0.61 m.
10.7							●	
		Borehole terminated at 10.7 m in shale						

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 16

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 14, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 123.1 m (I,II) and 123.0 (III,IIII) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.5		FILL: Red brown clayey silt fill, D.T.P.L.						
		WEATHERED SHALE: Red brown weathered shale, D.T.P.L.						
2.1		SHALE: Red brown shale with green layers						- borehole is back-filled with gravel from 5.18 m to 0.61 m.
							▲	- standpipe is slotted from 5.18 m to 0.61 m.
							●	
							●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 16 (cont'd)

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 14, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 123.1 m (I,II) and 123.0 (III,IIII) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
29.9		Borehole terminated at 29.9 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 17

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 15,16,17, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST A.B.

ELEVATION (Ground) 114.9 m (I,II) and 115.0 m (III,IIII) — TECHNOLOGIST

DEPTH (m)	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
0.0		WEATHERED SHALE: Red brown clayey silt, D.T.P.L.						- borehole is back-filled with gravel from 5.43 m to 0.61 m - standpipe is slotted from 5.43 m to 0.61 m.
4.6		- 1.0 m W.T.P.L.						
		SHALE: Red brown shale with green layers					▲	
							●	
							●	

● Piezometer Tip ▲ Standpipe Tip

Gartner Lee Associates Limited

BOREHOLE NO. 17

PROJECT NAME HALTON MONITORING — PROJECT NO. 80-96 - B

CLIENT REGIONAL MUNICIPALITY OF HALTON — DATE OCT. 15, 16, 17, 1980

BOREHOLE TYPE CME 75, 0.11 m I.D. AUGERS, 0.08 m TRICONE — GEOLOGIST

ELEVATION (Ground) 114.9 m (I,II) and 115.0 m (III,IIII) — TECHNOLOGIST

DEPTH	STRATIGRAPHY	DESCRIPTION	SAMPLE TYPE	SAMPLE BLOW/0.3 m	SAMPLE M/C	SAMPLE % RECOVERY	GROUND WATER	REMARKS
29.6		Borehole terminated at 29.6 m in shale.					●	

● Piezometer Tip ▲ Standpipe Tip

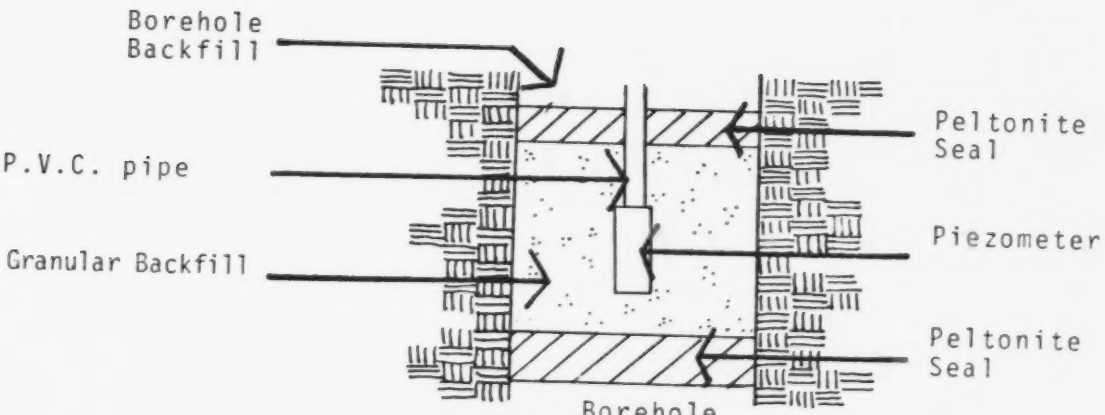
Gartner Lee Associates Limited

GROUND WATER MONITOR DETAILS

GROUND WATER MONITOR DETAILS

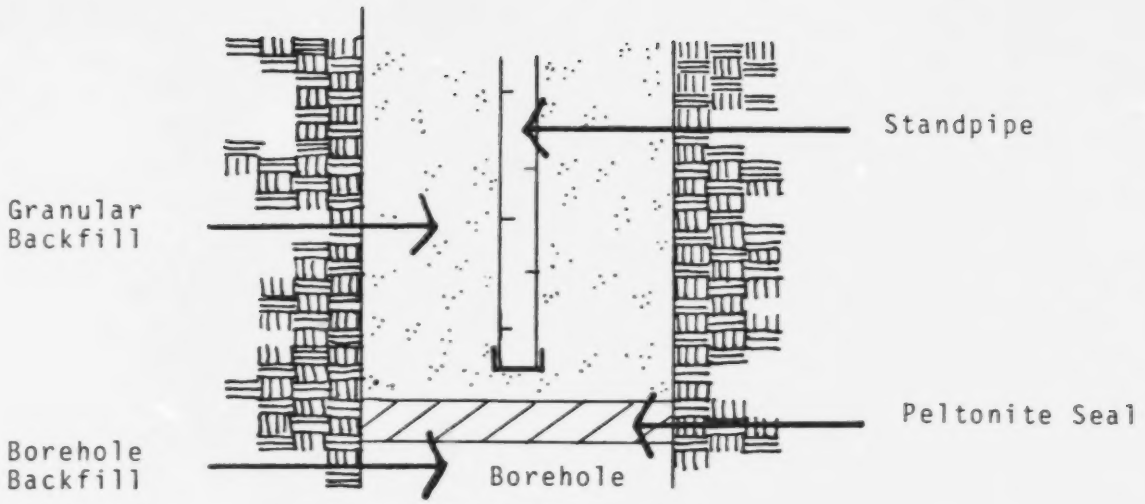
INSTALLATION DETAILS

A. PIEZOMETER: The piezometers consist of PVC pipe slotted and wrapped with fiberglass cloth over .5 m. Piezometers are used to measure the hydrostatic pressure, to obtain ground water samples and to measure in situ permeability.



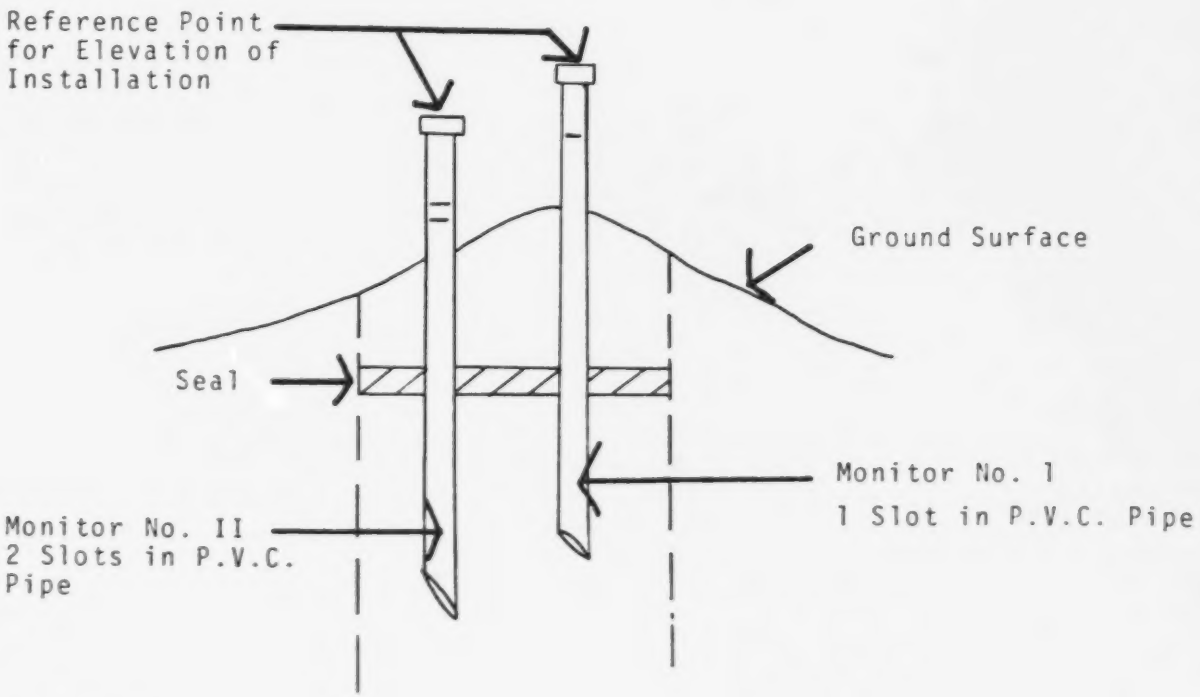
TYPICAL INSTALLATION

B. STANDPIPE: Standpipes consist of P.V.C. pipe with the bottom 2.4 m of each standpipe slotted every .3 m. Standpipes are used to measure the ground water table and to obtain ground water samples. Standpipes in boreholes 8A, 11A, 14, 15, 16 and 17 are slotted from the bottom of the monitor to 0.61 m below the surface.



TYPICAL INSTALLATION

SURFACE DETAILS



PROJECT 80-96-B

TABLE 3 SHEET 1

GROUND WATER MONITOR DETAILS

BOREHOLE NO.	*MONITOR				LOCATION OF TIP		LOCATION OF SEAL	
	No.	Diameter mm	Type	Elev.	Depth	Elev.	Depth	Elev.
1	I	32	● trow	183.7	18.6	165.1	18.0	165.7
	II	32	●	184.0	14.0	170.0	14.0, 13.4	170.0, 170.6
	III	19	▲	183.7	6.1	177.6	3.1, 0.9	180.6, 182.8
2	I	19	●	171.7	11.2	160.5	10.6	161.1
	II	19	▲	171.4	7.0	164.4	4.8, 0.9	166.6, 170.5
3	I	19	●	168.2	10.9	157.3	10.3	157.9
	II	19	▲	167.9	6.1	161.8	3.7, 0.9	164.2, 167
4	I	19	●	174.5	14.3	160.2	13.7	160.8
	II	19	▲	174.5	8.5	166.0	5.8, 1.2	168.7, 173.2
5	I	32	● trow	164.8	12.7	152.6	11.9	153.4
	II	32	●	164.8	8.0	158.1	7.4	157.7
	III	19	▲	165.3	5.0	160.3	5.3, 1.2	160.0, 164.1
6	I	19	●	174.2	17.5	156.6	16.8	157.4
	II	19	▲	174.2	11.1	163.1	8.2, 1.1	166.0, 173.1
7	I	32	●	181.5	15.4	166.1	14.8	166.7
	II	32	●	181.8	10.9	170.9	10.8, 10.3	171.0, 171.5
	III	19	▲	181.4	6.1	175.3	6.1, 3.1, 0.9	175.3, 178.3 180.5
8A	I	31	●	156.45	22.89	133.56	21.37	135.08
	II	31	▲	157.00	17.07	139.93	17.07	139.93
							1.83	155.17
9	I	32	●	142.5	11.0	131.5	10.4	132.1
	II	19	●	142.7	8.4	134.3	8.4, 7.8	134.3, 134.9
	III	19	▲	142.9	6.1	136.8	4.0, 1.6	138.9, 141.3
10	I	32	●	134.7	11.9	122.8	11.3	123.4
	II	32	●	134.7	5.8	128.9	5.8, 5.2	128.9, 129.5
	III	19	▲	134.9	3.7	131.2	0.8	134.1
11A	I	31	●	135.33	13.11	122.22	12.04	123.29
	II	31	▲	135.00	6.10	128.9	6.10	128.90
							1.37	133.63
12	I	32	● trow	127.9	12.7	115.2	12.0	115.9
	II	32	●	127.7	7.3	120.4	7.3, 7.0	120.4, 120.7
	III	19	▲	127.9	2.5	125.4	1.1	126.8
13	I	19	●	122.6	9.8	112.8	9.1	113.5
	II	19	▲	122.6	6.1	116.5	3.0, 1.2	119.6, 121.4

* All elevations taken from the top of monitor.

● - Piezometer ▲ - Standpipe

PROJECT 80-96-B TABLE 3 SHEET 2

GROUND WATER MONITOR DETAILS

BOREHOLE NO.	MONITOR				LOCATION OF TIP		LOCATION OF SEAL	
	No.	Diameter	Type	Elev.	Depth	Elev.	Depth	Elev
14	I	31	●	125.73	10.97	114.76	9.91	115.82
	II	31	▲	125.74	6.10	119.64	6.10	119.64
							1.07	124.67
15	I	31	●	121.39	10.94	110.45	9.88	111.51
	II	31	▲	121.81	6.10	115.71	6.10	115.71
							1.43	120.38
16	I	31	●	123.61	28.86	94.75	27.04	96.57
	II	31	●	124.03	17.74	106.29	17.74	106.29
							16.22	107.81
	III	31	●	123.92	9.91	114.01	8.84	115.08
	IIII	31	▲	123.91	6.10	117.81	6.10,1.52	117.81,122.39
17	I	31	●	115.47	29.93	85.54	28.56	86.91
	II	31	●	115.74	17.62	98.12	17.62	98.12
							16.40	99.34
	III	31	●	115.70	9.20	106.50	7.99	107.71
	IIII	31	▲	115.67	6.10	109.57	6.10	109.57
							1.28	114.39

* All elevations taken from top of monitor.

● - Piezometer ▲ - Standpipe

GROUND WATER ELEVATIONS

PROJECT 78-92

TABLE 4 SHEET 1

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Feb.26, 1979	Mar.19 1979	Apr.4, 1979	Apr.18, 1979	May 2, 1979	May 16, 1979	June 4, 1979	July 23, 1979			
1	I	●	173.4	173.3	173.4	173.1	173.2	173.2	173.3	173.4			
	II	●	181.0	181.3	181.5	181.6	181.4	181.4	181.4	181.6			
	III	▲	182.8	183.2	183.3	183.2	183.0	183.2	183.0	182.4			
2	I	●	168.0	168.3	168.3	168.6	168.4	168.5	168.4	167.5			
	II	▲	Frozen	Frozen	171.3	171.1	171.2	171.3	171.3	169.9			
3	I	●	163.8	163.0	163.0	163.7	163.5	163.5	163.4	162.4			
	II	▲	163.3	163.8	164.8	165.0	164.6	164.6	165.2	162.9			
4	I	●	171.2	170.8	170.5	167.9	167.9	166.4	166.6	166.4			
	II	▲	170.8	172.3	173.3	173.2	172.8	171.9	172.5	169.5			
5	I	●	163.1	163.4	163.2	161.5	155.0	154.0	154.2	154.6			
	II	●	Frozen	Frozen	Flowing	Flowing	Flowing	Flowing	Flowing	Destroyed			
	III	▲	Frozen	Frozen	165.0	165.0	165.0	165.0	164.9				
					Flowing	Flowing	Flowing	Flowing	Flowing				
6	I	●	160.5	160.2	164.7	164.7	164.7	164.7	164.7	163.9			
	II	▲	169.1	169.4	160.8	160.9	160.9	161.0	161.4	157.8			
					171.5	171.9	170.8	170.9	170.6	168.0			
7	I	●	177.8	176.8	176.9	176.8	177.8	177.0	177.4	177.5			
	II	●	179.0	179.7	180.0	179.3	180.2	180.3	180.2	178.0			
	III	▲	180.8	180.8	180.8	180.7	180.6	180.7	180.5	179.1			
8	I	●	136.9	135.5	137.2	136.0	135.3	135.7	135.3	136.5			
	II	▲	142.0	141.8	142.2	142.0	141.6	142.0	142.0	148.1			
9	I	●	Dry	Dry	Dry	131.8	Dry	Dry	Dry	Dry			
	II	●	Dry	Dry	Dry	135.9	135.5	134.8	135.7	Dry			
	III	▲	Dry	Dry	Dry	137.1	137.6	Dry	Dry	Dry			
10	I	●	128.2	128.5	128.5	129.1	129.0	128.9	129.1	128.2			
	II	●	132.7	132.6	132.6	132.9	133.1	132.7	133.0	132.0			
	III	▲	132.5	132.4	133.1	133.1	134.2	133.1	133.4	132.8			

● – Piezometer ▲ – Standpipe

PROJECT 78-92

TABLE 1 SHEET 2

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Feb.26, 1979	Mar.19, 1979	Apr.4, 1979	Apr.18, 1979	May 2, 1979	May 16, 1979	June 4, 1979	July 23, 1979			
11	I	●	128.5	128.6	128.9	127.2	127.3	125.9	126.3	129.6			
	II	▲	130.9	130.7	130.3	130.3	129.6	129.6	129.7	131.5			
12	I	●	121.4	121.5	122.1	122.3	122.2	122.1	122.0	121.2			
	II	●	122.3	124.9	125.8	124.6	125.2	125.3	125.2	124.3			
	III	▲	126.4	126.9	127.1	127.1	127.2	127.1	126.9	125.8			
13	I	●	119.5	120.0	120.6	120.5	120.0	120.0	119.9	119.2			
	II	▲	120.4	121.1	121.7	121.5	121.1	121.2	120.9	120.0			

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 3

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Nov.7 1979	Dec.6 1979	Jan.17 1980	Feb.6 1980	Mar.7 1980	Apr.18 1980	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr. 8 1981	May 25 1981
1	I	●	173.25	172.97	173.00	173.50	173.45	174.13	173.51	172.82	172.80	173.20	173.87
	II	●	179.00	178.97	179.90	181.06	180.94	181.23	179.13	178.80	180.14	181.07	181.39
	III	▲	181.27	181.11	181.66	182.62	182.51	183.10	181.56	181.45	182.68	183.00	182.74
2	I	●	166.57	166.82	166.89	168.30	167.81	168.35	166.56	166.49	166.95	168.10	168.20
	II	▲	168.63	169.42	170.29	171.37	170.08	171.37	168.95	168.54	170.02	170.82	170.81
3	I	●	161.04	160.55	160.60	162.30	161.95	162.06	161.28	160.84	160.58	161.94	Sealed
	II	▲	161.77	162.02	612.86	163.52	163.00	164.50	-	-	162.35	163.08	Sealed
4	I	●	166.30	166.21	166.28	166.05	166.33	166.37	166.25	165.97	165.53	165.60	Destroyed
	II	▲	167.38	168.07	169.73	172.00	171.00	173.37	167.57	167.40	172.77	173.87	Destroyed
5	I	●	154.53	154.70	154.69	154.80	154.91	155.23	Destroyed	-	-	-	-
	II	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	III	▲	161.90	162.16	162.97	164.25	164.25	164.68	162.35	162.82	Destroyed	-	-
6	I	●	160.39	160.45	160.69	160.10	160.30	160.45	160.55	160.47	160.15	160.25	Broken
	II	▲	166.30	167.07	168.17	169.90	168.63	171.25	166.48	166.41	169.24	170.58	Bent
7	I	●	175.26	174.98	175.20	175.00	176.67	176.85	175.28	174.72	175.23	176.28	176.34
	II	●	175.62	177.69	177.80	179.10	178.60	179.50	175.78	176.12	179.35	179.52	179.52
	III	▲	176.05	178.69	179.25	180.13	179.72	180.61	176.28	176.36	180.93	180.71	180.52
8	I	●	139.50	136.55	138.96	Destroyed or Burried	-	-	-	-	-	-	-
	II	▲	147.30	142.99	144.60		-	-	-	-	-	-	-
9	I	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	II	●	Destroyed	-	-	-	-	-	-	-	-	-	-
	III	▲	Destroyed	-	-	-	-	-	-	-	-	-	-

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 4

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Nov.7 1979	Dec.6 1979	Jan.17 1980	Feb.11 1980	Mar.7 1980	Apr.18 1980	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr. 8 1981	May 25 1981
10	I	●	127.73	128.36	128.50	128.50	128.07	128.86	127.60	127.85	Blocked	128.16	128.49
	II	●	132.27	132.38	132.23	132.25	131.90	132.39	131.72	131.83	131.97	132.2	132.13
	III	▲	133.12	133.50	133.42	133.42	133.08	133.59	133.25	Destroyed	-	133.06	133.33
11	I	●	128.25	125.70	126.37	126.75	-	-	-	-	-	-	-
	II	▲	130.55	130.18	130.13	130.00	Destroyed	-	-	-	-	-	-
12	I	●	121.41	121.41	121.67	121.75	121.50	121.87	120.91	121.01	121.05	121.35	121.58
	II	●	123.99	124.74	125.25	124.78	124.35	125.85	123.55	124.16	124.16	124.62	124.98
	III	▲	127.15	125.92	127.05	126.37	125.99	127.07	126.53	127.04	127.25	126.53	126.56
13	I	●	118.66	119.25	119.80	119.50	119.11	120.20	118.66	118.87	119.02	119.40	119.57
	II	▲	119.40	120.62	121.00	120.22	119.80	121.40	119.26	119.47	119.70	120.12	120.30

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 5

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Oct.30 1980	Dec.9 1980	Feb.25 1981	Apr.8 1981	May 25 1981	Oct.20 1981	Nov.25 1981				
8A	I	●	136.79	135.75	136.15	137.43	136.43	136.19	136.33				
	II	▲	140.50	140.90	Blocked Ice	140.95	-	140.96	140.92				
11A	I	●	125.68	128.11	126.35	126.19	127.98	126.28	126.93				
	II	▲	Dry	130.43	129.95	129.05	129.13	dry	130.75				
14	I	●	124.18	124.31	124.47	124.34	124.38	124.34	124.39				
	II	▲	124.53	124.88	124.97	124.85	124.78	124.87	124.90				
15	I	●	119.92	120.23	120.46	120.16	120.16	120.20	120.29				
	II	▲	120.34	120.71	121.10	120.83	120.7	120.71	121.08				
16	I	●	115.37	115.28	115.34	115.11	114.98	114.85	115.06				
	II	●	115.71	115.71	115.70	115.81	116.14	115.95	116.19				
	III	●	117.17	118.75	118.73	118.94	119.19	118.94	119.32				
	IIII	▲	121.01	121.23	121.33	121.40	121.65	121.36	121.93				
17	I	●	113.89	114.09	114.06	114.01	114.06	113.72	113.93				
	II	●	113.84	114.04	114.01	114.07	114.13	113.94	114.15				
	III	●	114.56	114.88	Blck.Ice	114.88	114.90	114.82	115.09				
	IIII	▲	114.64	114.95	114.97	114.92	114.92	114.88	115.13				

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 4 SHEET 6

GROUND WATER ELEVATIONS

BOREHOLE NUMBER	MONITOR No.	MONITOR Type	Oct.20 1981	Nov.23 1981									
1	1	●	173.82	173.71									
	11	●	180.28	180.6									
	111	▲	181.45	183.2									
2	1	●	167.17	167.62									
	11	▲	169.71	170.62									
6	1	●	bent	bent									
	11	▲	160.58	bent									
7	1	●	176.30	not									
	11	●	178.89	located									
	111	▲	180.77										
10	1	●	128.02	128.20									
	11	●	132.01	132.34									
	111	▲	132.53	133.19									
12	1	●	121.33	121.74									
	11	●	124.47	125.5									
	111	▲	126.39	127.3									
13	1	●	119.20	121.15									
	11	▲	119.60	121.12									

● - Piezometer ▲ - Standpipe

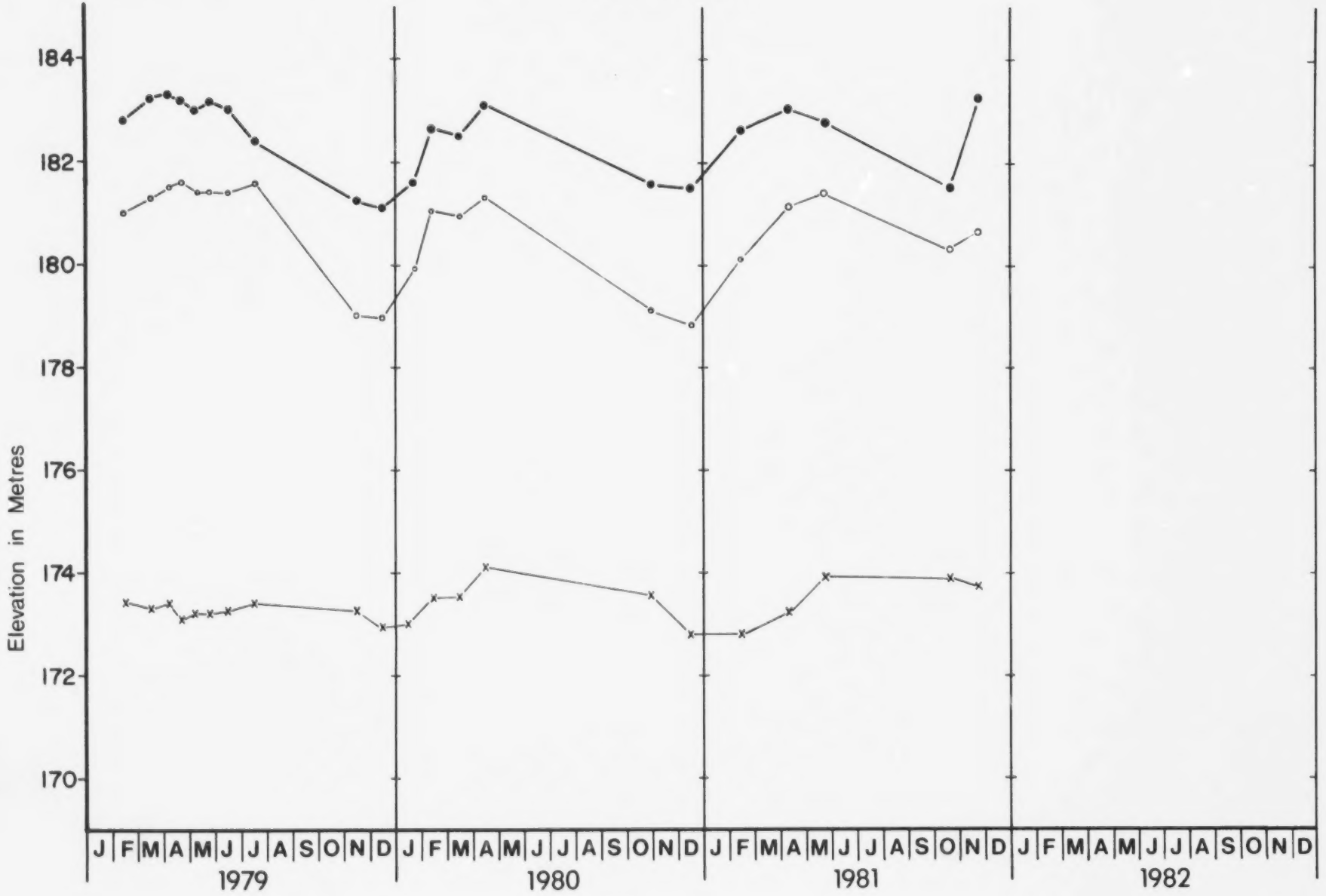
Gartner Lee Associates Limited

HYDROGRAPHS

FIGURE 6

Hydrograph

Project 80-96-B

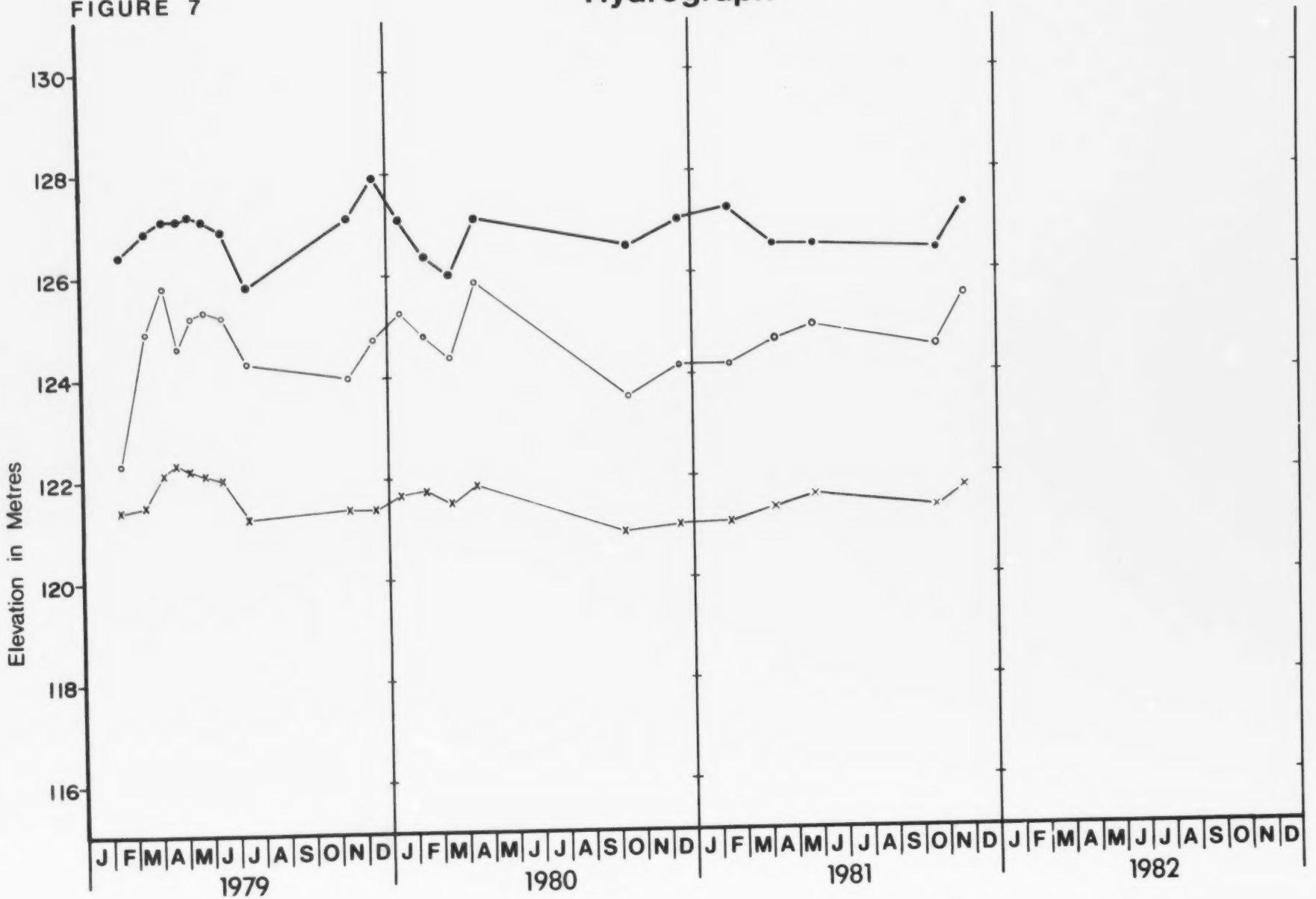

184
182
180
178
176
174
172
170
Elevation in Metres
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1979
1980
1981
1982

BURLINGTON LANDFILL SITE : Borehole 1 , Monitors I ——, II ○——○, III •——•

FIGURE 7

Hydrograph

Project 80.96.B


Elevation in Metres
130
128
126
124
122
120
118
116
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1979
1980
1981
1982

BURLINGTON LANDFILL SITE : Borehole 12 , Monitors I ×—× , II ○—○ , III ●—●

ESTIMATED SURFACE WATER FLOWS

PROJECT 80-96-B

TABLE 5 SHEET 1

ESTIMATED SURFACE WATER FLOWS - FALCON CREEK

Station		Apr. 4 1979	Apr. 18 1979	May 2 1979	May 16 1979	June 4 1979	July 23 1979	Nov. 7 1979	Dec. 6 1979	Jan. 17 1980	Feb. 11 1980	Mar. 7 1980
1	Upstream	890	820	890	1800	680	Dry	100	150	180	Dry	Dry
2	Adjacent											
3	Downstream	890	820	890	1800	740	Dry	180	220	180	Dry	Dry
	All Flows	in L/min										

● – Piezometer ▲ – Standpipe

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 5 SHEET 2

ESTIMATED SURFACE FLOWS - FALCON CREEK

Station		Apr. 18 1980	Oct. 30 1980	Dec. 5 1980	Feb. 25 1981	Apr.8 1981	May 21 1981	Oct 20 1981	Nov.23 1981			
1	Upstream	4800	Dry	Dry	2600	500	1000	200	2000			
2	Adjacent	-	Dry	Dry	3000	600	1500	200	2300			
3	Downstream	4500	Dry	Dry	4000	800	2500	200	2800			

● - Piezometer ▲ - Standpipe

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APPENDIX II

GROUND WATER QUALITY ANALYSES

ONTARIO MINISTRY OF THE ENVIRONMENT

DRINKING WATER QUALITY CRITERIA FOR THE SUBSTANCES ANALYZED

SUBSTANCE	CONCENTRATION mg/L
Chloride (Cl)	250.0
Sulphate (SO_4)	250.0
Organic Nitrogen (Total Kjeldahl minus Free Ammonia)	0.15
Nitrate (N)	10.0
Iron (Fe)	0.3
Phenols	0.001

PROJECT 80-96-B

TABLE 6 SHEET 1

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 1 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	April 1981	Nov. 1981	1979-80 Mean
CONDUCTIVITY μMHOS CM		5020	5900	4900	5500	5700	5600	5600	5600	5750	4175	5480
pH								7.3	7.5	-	7.3	7.4
HARDNESS ($CaCO_3$)										1945	1520	
COD								58	44	50	25	51
CHLORIDES (Cl)								210	240	230	187	225
SULPHATES (SO_4)								3400	3600	3850	2700	3500
PHOSPHOROUS AS P	Total									.14	.5	
	Soluble									.1	-	
NITROGEN (N)	Total Kjeldahl									1.2	8.0	
	Free Ammonia									<.1	<.1	
	Nitrite									.01	1.3	
	Nitrate									<.1	9.3	
METALS	Potassium (K)	46	51	43	49	49	50				39.6	48
	Magnesium (Mg)										156	
	Calcium (Ca)										352	
	Sodium (Na)		880								680	880
	Iron (Fe)	3.0	3.0	7.5	4.8	2.2	2.0			4.4	1.03	3.8
Phenol (ppb)		2	2	<1	1	<1	1	<1	<1	<1	-	1
BOD		12.0	6.0	44	3.0	4.0	4.5	26	15	9.0	28	14
DOC or *Alkalinity		9.2	1.8	3.2	3.4	3.4	2.0				686	3.8

NOTE: concentrations in p.p.m. unless otherwise noted.

PROJECT 80-96-B

TABLE 6 SHEET 2

WATER ANALYSIS RESULTS

LOCATION - BURLINGTON, LANDFILL SITE

REMARKS - BOREHOLE 1 PIEZOMETER II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS CM		2600	2750	2800	2075							2675
pH		7.7	7.5	-	7.6							7.6
HARDNESS ($CaCO_3$)				696	573							
COD		47	51	21	30							49
CHLORIDES (Cl)		25	18	17	62							22
SULPHATES (SO_4)		930	900	875	650							915
PHOSPHOROUS AS P	Total			.1	.3							
	Soluble			.1	-							
NITROGEN (N)	Total Kjeldahl			.8	2.8							
	Free Ammonia			.8	.1							
	Nitrite			.1	.03							
	Nitrate			.02	2.5							
METALS	Potassium (K)				10.2							
	Magnesium (Mg)				98							
	Calcium (Ca)				68							
	Sodium (Na)				365							
	Iron (Fe)			1.23	1.27							
Phenol (ppb)		2	1	1	-							1.5
BOD		5.0	7.5	5.0	16							6.3
Alkalinity					650							

NOTE: concentrations in p p m unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 3

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 2 PIEZOMETER I

PROPERTY		Oct. 1980	Apr. 1981	Nov. 1981
CONDUCTIVITY μMHOS CM		1750	2020	2050
pH		7.7	-	7.4
HARDNESS ($CaCO_3$)			989	1090
COD		83	56	25
CHLORIDES (Cl)		57	22	13
SULPHATES (SO_4)		600	725	900
PHOSPHOROUS AS P	Total		.12	.2
	Soluble		.04	-
NITROGEN N	Total Kjeldahl		3.4	3.8
	Free Ammonia		2.8	.1
	Nitrite		.01	.06
	Nitrate		.1	3.7
METALS	Potassium (K)			44
	Magnesium (Mg)			153
	Calcium (Ca)			184
	Sodium (Na)			146
	Iron (Fe)		7.20	6.50
Phenol (ppb)		1	1	-
BOD		10	4.0	16
Alkalinity				575

NOTE: concentrations in p p m unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 4

WATER ANALYSIS RESULTS

LOCATION . BURLINGTON LANDFILL SITE

REMARKS . BOREHOLE 2 STANDPIPE II

PROPERTY		Oct. 1980	Apr. 1981	Nov. 1981								
CONDUCTIVITY μMHOS CM		1525	1600	1525								
pH		7.7	-	7.4								
HARDNESS ($CaCO_3$)			910	922								
COD		24	27	17								
CHLORIDES (Cl)		5	4	6								
SULPHATES (SO_4		600	395	510								
PHOSPHOROUS AS P	Total		.44	.32								
	Soluble		.04	-								
NITROGEN N	Total Kjeldahl		1.0	.6								
	Free Ammonia		<.1	.1								
	Nitrite		.01	.01								
	Nitrate		<.1	.1								
METALS	Potassium (K)			22.8								
	Magnesium (Mg)			168								
	Calcium (Ca)			92								
	Sodium (Na)			72								
	Iron (Fe)		24.5	19.0								
Phenol (ppb)		2	<1	-								
BOD		9.0	4.0	3.0								
Alkalinity				688								

NOTE: concentrations in p p m unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 5 SHEET 5

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 3A PIEZOMETER I

PROPERTY		Oct. 1980	Apr. 1981									
CONDUCTIVITY μMHOS CM		2150	3060									
pH		7.0	-									
HARDNESS ($CaCO_3$)			1490									
COD		1120	1190									
CHLORIDES (Cl)		71	180									
SULPHATES (SO_4)		760	215									
PHOSPHOROUS AS P	Total		.70									
	Soluble		.16									
NITROGEN N	Total Kjeldahl		9.0									
	Free Ammonia		2.0									
	Nitrite		.06									
	Nitrate		.1									
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)		28.2									
Phenol (ppb)		16	500									
BOD		360	680									

NOTE concentrations in ppm unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 6

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 8A STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981								1980 Mean
CONDUCTIVITY μMHOS CM		8600	8800	7800								8700
pH		6.3	6.4	-								6.4
HARDNESS ($CaCO_3$)				2330								
COD		12000	7400	5140								9700
CHLORIDES (Cl)		690	733	816								712
SULPHATES (SO_4)		81	65	40								73
PHOSPHOROUS AS P	Total			10								
	Soluble			.28								
NITROGEN (N)	Total Kjeldahl			305								
	Free Ammonia			240								
	Nitrite			.20								
	Nitrate			<.1								
METALS	Potassium (K)											
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											
	Iron (Fe)			420								
Phenol (ppb)		4500	3000	2860								3750
BOD		6400	6400	290								6400

NOTE concentrations in ppm unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 7

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 10 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981	1979-80 Mean
CONDUCTIVITY μMHOS CM		3500	3500	3040	3730	3800	3600	3575	3600	3800	3300	3540
pH								7.1	7.0	-	7.2	7.1
HARDNESS ($CaCO_3$)										1634	1503	
COD								240	68	60	30	154
CHLORIDES (Cl)								348	370	392	351	360
SULPHATES (SO_4)								1440	1420	1550	1500	1430
PHOSPHOROUS AS P	Total									.12	.08	
	Soluble									.02	-	
NITROGEN N	Total Kjeldahl									2.4	1.6	
	Free Ammonia									2.0	.1	
	Nitrite									.02	.06	
	Nitrate									.1	1.8	
METALS	Potassium (K)	6.2	56	135	49	48	46				45	57
	Magnesium (Mg)										122	
	Calcium (Ca)										400	
	Sodium (Na)		330								350	330
	Iron (Fe)	3.6	6.0	18	4.2	2.9	3.8			7.4	3.3	6.4
Phenol (ppb)		11	1	1	1	1	1	1	1	1	-	1
BOD		170	70	80	17	10	8.0	32	16	10	9.5	50
DOC or Alkalinity*		82	56	41	12	9.8	6.2				*370	34.5

NOTE: concentrations in p p m unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 8

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 10 PIEZOMETER II

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981	1979-80 Mean
CONDUCTIVITY μMHOS CM		2775	2750	2070	3000	3160	2760	2850	2675	2580	1700	2755
pH								7.7	7.8	-	7.3	7.8
HARDNESS ($CaCO_3$)											732	
COD								81	85	57	110	83
CHLORIDES (Cl)								155	150	139	87	153
SULPHATES (SO_4)								1040	1000	750	490	1020
PHOSPHOROUS AS P	Total									.38	1.6	
	Soluble									.02		
NITROGEN	Total Kjeldahl									1.4	11.0	
	Free Ammonia									.1	6.5	
	Nitrite									.02	.02	
	Nitrate									.3	.1	
METALS	Potassium (K)	33	31.5	30	31	30	28				21.8	31
	Magnesium (Mg)										90	
	Calcium (Ca)										144	
	Sodium (Na)		340								147	340
	Iron (Fe)	4.5	5.0	25	11.2	4.8	6.7			15.5	1.0	9.5
Phenol (ppb)		2	1	<1	2	1	1	1	<1	<1		1
BOD		62	34	4.0	4.0	3.0	4.5	12	10	4.0	46	16.7
DOC or Alkalinity *		27	31	15	12.6	12.8	11.4				506 *	18.3

NOTE: concentrations in p.p.m unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 9

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 10 STANDPIPE III

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	Feb. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980			1979-80 Mean
CONDUCTIVITY μMHOS CM		1779	2150	2750	2250	2730	2860	1340	2675			2320
pH								7.8	7.8			7.8
HARDNESS (Ca CO_3)												
COD								180	85			133
CHLORIDES (Cl)								64	150			107
SULPHATES (SO_4)								330	1000			665
PHOSPHOROUS AS P	Total											
	Soluble											
NITROGEN N	Total Kjeldahl											
	Free Ammonia											
	Nitrite											
	Nitrate											
METALS	Potassium (K)	25	23	24	18	21	20					22
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)		135									135
	Iron (Fe)	325	105	42.5	14.5	300	22					135
Phenol (ppb)		<1	<1	5	7	<1	70	1	<1			10
BOD		80	12	66	20	16	140	18	10			45
DOC		19.2	26	120	27.5	18.8	40					42

NOTE concentrations in p p m unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B TABLE 6 SHEET 10

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 11A PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS CM		5050	3680	4480	3175							4365
pH		7.4	7.0	-	6.9							7.2
HARDNESS ($Ca\ CO_3$)				1382	1596							
COD		250	130	140	160							190
CHLORIDES (Cl)		1420	660	1010	485							1040
SULPHATES (SO_4)		255	1040	490	750							648
PHOSPHOROUS AS P	Total			.88	1.20							
	Soluble			.02	-							
NITROGEN N	Total Kjeldahl			11	9.3							
	Free Ammonia			7.8	4.6							
	Nitrite			.02	.01							
	Nitrate			.1	.1							
METALS	Potassium (K)				18.2							
	Magnesium (Mg)				157							
	Calcium (Ca)				380							
	Sodium (Na)				218							
	Iron (Fe)				215							
Phenol (ppb)		2	1	1	-							1
BOD		40	66	11	22							53
Alkalinity					706							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 11

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 11A STANDPIPE II

PROPERTY		Dec. 1980	Nov. 1981									
CONDUCTIVITY μMHOS CM		4180	3345									
pH		7.1	7.2									
HARDNESS (Ca CO_3)			1715									
COD		210	170									
CHLORIDES (Cl)		950	520									
SULPHATES (SO_4)		1040	780									
PHOSPHOROUS AS P	Total		1.00									
	Soluble		-									
NITROGEN (N)	Total Kjeldahl		13.0									
	Free Ammonia		10.0									
	Nitrite		.01									
	Nitrate		.1									
METALS	Potassium (K)		28.6									
	Magnesium (Mg)		186									
	Calcium (Ca)		380									
	Sodium (Na)		235									
	Iron (Fe)		435									
Phenol (ppb)		1	-									
BOD		14	55									
Alkalinity			755									

NOTE concentrations in p p m unless otherwise noted

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6. SHEET 12

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 12 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981		Mean
CONDUCTIVITY μMHOS CM		2888	7700	7600	9350	9180	9400	9500	9900	9200		7950
pH							7.2	7.2	-	7.0		7.2
HARDNESS ($Ca CO_3$)									2670	2650		
COD							180	61	68	75		121
CHLORIDES (Cl)							2610	2740	2760	2712		2675
SULPHATES (SO_4)							1620	1540	1400	1500		1580
PHOSPHOROUS AS P	Total								.03	.06		
	Soluble								.02	-		
NITROGEN (N)	Total Kjeldahl								0.8	3.4		
	Free Ammonia								.1	.1		
	Nitrite								.15	.57		
	Nitrate								.3	7.6		
METALS	Potassium (K)	19	65	67	64	65				68		56
	Magnesium (Mg)									187		
	Calcium (Ca)									752		
	Sodium (Na)		1100							1290		1100
	Iron (Fe)	3.0	8.0	25	3.1	1.5			3.0	.92		8.1
Phenol (ppb)		1	1	1	1	<1	1	1	1	-		<1
BOD		11	8.0	3.5	4.0	4.5	20	4.0	5.0	11.0		7.9
DOC or Alkalinity *		6.2								*54		6.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 13

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 12 PIEZOMETER II

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981		1979-80 Mean
CONDUCTIVITY μMHOS CM		3720	3600	3800	4100	4000	4100	4050	4200	3750		3910
pH							7.2	6.9	-	7.1		7.1
HARDNESS ($CaCO_3$)									1882	1730		
COD							120	710	47	40		415
CHLORIDES (Cl)							338	331	360	354		335
SULPHATES (SO_4)							1700	1580	1475	1650		1640
PHOSPHOROUS AS P	Total								.06	1.20		
	Soluble								.02	-		
NITROGEN (N)	Total Kjeldahl								1.8	1.8		
	Free Ammonia								1.0	.8		
	Nitrite								.01	.15		
	Nitrate								.1	.4		
METALS	Potassium (K)	41	42	45	44	44				45		43
	Magnesium (Mg)									13 9		
	Calcium (Ca)									464		
	Sodium (Na)		380							400		380
	Iron (Fe)	6.4	5.0	42	7.5	4.3			6.8	8.6		13.0
Phenol (ppb)		<1	1	1	1	<1	<1	1	<1	-		<1
BOD		6.0	1.4	1.4	4.5	2.5	7.5	8.0	4.0	4.0		4.5
DOC or *Alkalinity		3.0	3.0	2.4	4.2	4.4				*662		3.4

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 14

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 12 STANDPIPE III

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	April 1980	April 1981	Nov. 1981					1979-80 Mean
CONDUCTIVITY μMHOS CM		3450	3650	3700	4610	2100	1130					3850
pH						-	7.5					
HARDNESS ($CaCO_3$)						2165	613					
COD						1220	720					
CHLORIDES (Cl)						259	112					
SULPHATES (SO_4)						460	250					
PHOSPHOROUS AS P	Total					18	11.0					
	Soluble					.02	-					
NITROGEN (N)	Total Kjeldahl					31	16					
	Free Ammonia					.4	.1					
	Nitrite					.06	.01					
	Nitrate					.1	.4					
METALS	Potassium (K)	32	54	52	35		19.8					43
	Magnesium (Mg)						66					
	Calcium (Ca)						136					
	Sodium (Na)		325				64					325
	Iron (Fe)	153	24	25	3.9	1460	1270					51.5
Phenol (ppb)		.1	.1	1	2	.1	-					1
BOD		28	5.0	2.5	7.0	48	50					10.6
DOC or Alklinity*		8.0	15.0	5.2	12.4		*1953					10.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 15

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 13 PIEZOMETER I

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981		1979-80 Mean
CONDUCTIVITY μMHOS CM		11620	14800	13700	16400	14300	14800	15500	16,100	14,800		14450
pH									-	7.5		
HARDNESS ($CaCO_3$)									5025	4418		
COD							400	470	133	210		435
CHLORIDES (Cl)							4880	6240	5420	6000		5560
SULPHATES (SO_4)							1440	1600	1680	340		1520
PHOSPHOROUS AS P	Total								.16	.42		
	Soluble								.02	-		
NITROGEN (N)	Total Kjeldahl								4.0	9.4		
	Free Ammonia								3.9	9.4		
	Nitrite								.02	.67		
	Nitrate								.1	.8		
METALS	Potassium (K)	63	77	78	80	71				79		74
	Magnesium (Mg)									340		
	Calcium (Ca)									1208		
	Sodium (Na)		2120							2100		2120
	Iron (Fe)	7.4	11	20	3.1	3.0			13.8	10.4		8.9
Phenol (ppb)		8	1	1	1	1	1	1	1	-		1
BOD		28	16	13	5.0	3.5	9.0	7.0	2.5	6.0		11.6
Alkalinity										284		

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 16

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 13 STANDPIPE II

PROPERTY		Nov. 1979	Dec. 1979	Jan. 1980	March 1980	April 1980	Apr. 1981	Nov. 1981				Mean
CONDUCTIVITY μMHOS CM		4160	2250	2750	2440	2050	2660	2250				2730
pH							-	7.5				
HARDNESS ($CaCO_3$)							1096	894				
COD							45	75				
CHLORIDES (Cl)							462	344				
SULPHATES (SO_4)							420	320				
PHOSPHOROUS AS P	Total						.20	5.4				
	Soluble						.02	-				
NITROGEN (N)	Total Kjeldahl						1.2	33				
	Free Ammonia						.4	20				
	Nitrite						.05	.02				
	Nitrate						.6	.1				
METALS	Potassium (K)	22	11.4	13	10	9.1		14.6				13.1
	Magnesium (Mg)							96				
	Calcium (Ca)							212				
	Sodium (Na)							163				
	Iron (Fe)	63	8.9	15	8.0	3.4	9.6	68				19.7
Phenol (ppb)		<1	1	<1	1	<1	<1	-				<1
BOD		11	4.0	3.5	5.0	2.0	2.5	170				5.1
DOC or Alkalinity*			7.4	4.1	7.0	4.0		*554				5.6

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 17

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 14 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY µMHOS/CM		5800	5825	6000	5800							5810
pH		7.1	7.3	-	7.3							7.2
HARDNESS ($CaCO_3$)				1848	1832							
COD		270	150	120	70							210
CHLORIDES (Cl)		1390	1313	1350	1310							1352
SULPHATES (SO_4)		1440	1480	1560	1500							1460
PHOSPHOROUS AS P	Total			.16	.08							
	Soluble			.02	-							
NITROGEN (N)	Total Kjeldahl			4.6	4.6							
	Free Ammonia			4.4	4.3							
	Nitrite			.01	.01							
	Nitrate			.1	.1							
METALS	Potassium (K)				74							
	Magnesium (Mg)				110							
	Calcium (Ca)				552							
	Sodium (Na)				720							
	Iron (Fe)			9.70	106							
Phenol (ppb)		1	1	1	-							1
BOD		26	15	8.0	16.0							20.5
Alkalinity					144							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 18

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 14 STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS/CM		3400	2925	2860	2650							3160
pH		7.4	7.3	-	7.3							7.4
HARDNESS ($Ca\ CO_3$)				1214	1186							
COD		71	110	51	60							91
CHLORIDES (Cl)		428	256	227	500							342
SULPHATES (SO_4)		1080	1100	870	1000							1090
PHOSPHOROUS AS P	Total			1.8	.72							
	Soluble			.02	-							
NITROGEN (N)	Total Kjeldahl			2.2	1.0							
	Free Ammonia			.2	.1							
	Nitrite			.02	.01							
	Nitrate			.1	.1							
METALS	Potassium (K)				19							
	Magnesium (Mg)				135							
	Calcium (Ca)				252							
	Sodium (Na)				275							
	Iron (Fe)			87	72							
Phenol (ppb)		1	1	1								1
BOD		12	4.5	4.0	4.0							8.3
Alkalinity					520							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 19

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS BOREHOLE 15 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS/CM		3575	3500	3870	3350							3540
pH		7.3	7.4	-	7.6							7.4
HARDNESS ($Ca CO_3$)				1058	997							
COD		260	74	92	55							167
CHLORIDES (Cl)		947	957	990	903							952
SULPHATES (SO_4)		270	320	280	290							295
PHOSPHOROUS AS P	Total			.10	.10							
	Soluble			.1	-							
NITROGEN (N)	Total Kjeldahl			3.4	2.6							
	Free Ammonia			2.8	2.1							
	Nitrite			.01	.19							
	Nitrate			.1	.2							
METALS	Potassium (K)				68							
	Magnesium (Mg)				87							
	Calcium (Ca)				256							
	Sodium (Na)				405							
	Iron (Fe)			4.80	1.44							
Phenol (ppb)		1	1	1	-							1
BOD		28	17	10	7							22.5
Alkalinity					249							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 20

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 15 STANDPIPE II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS/CM		2225	2200	1970	1480							2213
pH		7.2	7.0	-	7.5							7.1
HARDNESS ($CaCO_3$)				906	704							
COD		34	780	72	30							407
CHLORIDES (Cl)		207	200	171	120							204
SULPHATES (SO_4)		590	680	435	320							635
PHOSPHOROUS AS P	Total			1.9	.62							
	Soluble			.08	-							
NITROGEN (N)	Total Kjeldahl			3.2	1.6							
	Free Ammonia			.4	.1							
	Nitrite			.03	.01							
	Nitrate			.3	.3							
METALS	Potassium (K)				22.4							
	Magnesium (Mg)				64							
	Calcium (Ca)				176							
	Sodium (Na)				100							
	Iron (Fe)			110	42							
Phenol (ppb)		1	1	1	-							1
BOD		3.0	7.0	7.0	5.0							5.0
Alkalinity					428							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 21

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS CM		500	440	500	540							470
pH		7.4	7.5	-	7.7							7.5
HARDNESS ($Ca\ CO_3$)				196	209							
COD		760	320	715	720							540
CHLORIDES (Cl)		<1	43	50	46							22
SULPHATES (SO_4)		49	52	50	64							51
PHOSPHOROUS AS P	Total			.16	.12							
	Soluble			.06	-							
NITROGEN (N)	Total Kjeldahl			.8	.6							
	Free Ammonia			<.1	<.1							
	Nitrite			.01	<.01							
	Nitrate			<.1	<.1							
METALS	Potassium (K)				3.8							
	Magnesium (Mg)				10							
	Calcium (Ca)				68							
	Sodium (Na)				31.5							
	Iron (Fe)			3.5	2.0							
Phenol (ppb)		17	21	12	-							19
BOD		36	36	37	34							36
Alkalinity					139							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 22

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 PIEZOMETER II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS/CM		460	16100	26,500	17,750							8280
pH		7.3	7.1	-	7.2							7.2
HARDNESS ($CaCO_3$)				4635	3318							
COD		460	440	330	340							450
CHLORIDES (Cl)		1	6440	9240	6600							3220
SULPHATES (SO_4)		43	700	2150	1740							372
PHOSPHORCUS AS P	Total			-	.08							
	Soluble			.06	-							
NITROGEN (N)	Total Kjeldahl			-	8							
	Free Ammonia			12	9							
	Nitrite			.01	.01							
	Nitrate			.2	.1							
METALS	Potassium (K)				122							
	Magnesium (Mg)				238							
	Calcium (Ca)				936							
	Sodium (Na)				3350							
	Iron (Fe)			2.1	1.76							
Phenol (ppb)		2	1	4								2
BOD		14	11	6.0	2.5							12.5
Alkalinity					96							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 23

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 PIEZOMETER III

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS CM		52700	50600	57,000	51,000							51650
pH		6.9	7.0	-	6.8							7.0
HARDNESS ($CaCO_3$)				16,420	16,110							
COD		1400	56	560	760							728
CHLORIDES (Cl)		27840	25400	24,700	26,600							26620
SULPHATES (SO_4)		1400	1500	2000	1800							1450
PHOSPHOROUS AS P	Total			-	.04							
	Soluble			.06	-							
NITROGEN (N)	Total Kjeldahl			-	16							
	Free Ammonia			30	33							
	Nitrite			.01	.01							
	Nitrate			.1	.1							
METALS	Potassium (K)				430							
	Magnesium (Mg)				1266							
	Calcium (Ca)				4360							
	Sodium (Na)				8700							
	Iron (Fe)			1.71	1.33							
Phenol (ppb)		3	9	1	-							6
BOD		9.0	6.0	4.0	1.2							7.5
Alkalinity					56							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 24

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 16 STANDPIPE IIII

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS/CM		3900	2950	3500	1800							3425
pH		7.5	7.2	-	7.6							7.3
HARDNESS ($CaCO_3$)				1244	673							
COD		47	56	68	65							52
CHLORIDES (Cl)		496	346	406	201							421
SULPHATES (SO_4)		820	900	890	350							860
PHOSPHOROUS AS P	Total			.70	.18							
	Soluble			.2								
NITROGEN (N)	Total Kjeldahl			1.6	1.4							
	Free Ammonia			.4	.1							
	Nitrite			.02	.01							
	Nitrate			.1	.4							
METALS	Potassium (K)				18.8							
	Magnesium (Mg)				61							
	Calcium (Ca)				168							
	Sodium (Na)				179							
	Iron (Fe)			78	11.9							
Phenol (ppb)		1	1	.1								1
BOD		3.5	3.5	2.0	3.0							3.5
Alkalinity					418							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 25

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 PIEZOMETER I

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY µMHOS/CM		585	535	1460	21,750							560
pH		7.6	7.6	-	7.2							7.6
HARDNESS ($CaCO_3$)				301	5560							
COD		550	120	235	490							335
CHLORIDES (Cl)		86	80	337	8300							83
SULPHATES (SO_4)		48	50	84	1600							49
PHOSPHOROUS AS P	Total			.08	.06							
	Soluble			.04								
NITROGEN (N)	Total Kjeldahl			1.0	8.4							
	Free Ammonia			.6	12							
	Nitrite			.01	.01							
	Nitrate			.1	.1							
METALS	Potassium (K)				115							
	Magnesium (Mg)				379							
	Calcium (Ca)				1600							
	Sodium (Na)				4300							
	Iron (Fe)			3.1	1.59							
Phenol (ppb)		1	4	1	-							3
BOD		16	12	8.0	3.0							14
Alkalinity					142							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 26

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 PIEZOMETER II

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY µMHOS/CM		555	1220	2640	3225							890
pH		7.6	7.7	-	7.8							7.7
HARDNESS ($CaCO_3$)				490	618							
COD		170	120	67	65							145
CHLORIDES (Cl)		73	209	535	751							141
SULPHATES (SO_4)		57	160	295	390							109
PHOSPHOROUS AS P	Total			.06	.04							
	Soluble			.02	-							
NITROGEN (N)	Total Kjeldahl			2.4	2.2							
	Free Ammonia			2.0	.1							
	Nitrite			.01	.47							
	Nitrate			.1	.6							
METALS	Potassium (K)				37.5							
	Magnesium (Mg)				60							
	Calcium (Ca)				148							
	Sodium (Na)				550							
	Iron (Fe)			2.15	.54							
Phenol (ppb)		<1	<1	1	-							<1
BOD		6.0	4.0	5.0	2.0							5.0
Alkalinity					280							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 6 SHEET 27

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 PIEZOMETER III

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY µMHOS/CM		1600	1510	1600	1625							1555
pH		7.5	6.9	-	7.7							7.2
HARDNESS (Ca CO_3)				668	671							
COD		120	76	43	40							98
CHLORIDES (Cl)		237	230	220	246							234
SULPHATES (SO_4)		240	260	230	240							250
PHOSPHOROUS AS P	Total			.08	.10							
	Soluble			.02	-							
NITROGEN (N)	Total Kjeldahl			.4	1.0							
	Free Ammonia			<.1	.2							
	Nitrite			.02	.01							
	Nitrate			.3	.2							
METALS	Potassium (K)				14.6							
	Magnesium (Mg)				36							
	Calcium (Ca)				160							
	Sodium (Na)				107							
	Iron (Fe)			2.7	.36							
Phenol (ppb)		<1	<1	1	-							<1
BOD		3.0	2.0	7.5	3.0							2.5
Alkalinity					337							

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

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TABLE 6 SHEET 28

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS BOREHOLE 17 STANDPIPE IIII

PROPERTY		Oct. 1980	Dec. 1980	Apr. 1981	Nov. 1981							1980 Mean
CONDUCTIVITY μMHOS CM		1800	1900	1660	1625							1850
pH		7.7	7.8	-	7.5							7.8
HARDNESS ($CaCO_3$)				716	549							
COD		110	69	72	70							90
CHLORIDES (Cl)		222	235	229	203							229
SULPHATES (SO_4)		365	380	250	230							373
PHOSPHOROUS AS P	Total				.34							
	Soluble				-							
NITROGEN (N)	Total Kjeldahl				.6							
	Free Ammonia				.1							
	Nitrite				.01							
	Nitrate				.4							
METALS	Potassium (K)				11.6							
	Magnesium (Mg)				65							
	Calcium (Ca)				112							
	Sodium (Na)				148							
	Iron (Fe)			201	30							
Phenol (ppb)		1	1	1	-							<1
BOD		7.5	3.0	4.0	9.5							5.3
Alkalinity					366							

NOTE: concentrations in p.p.m. unless otherwise noted.

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PROJECT 80-96-B

TABLE 6 SHEET

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS MANHOLE - LEACHATE COLLECTION SYSTEM

PROPERTY		Nov. 1981										
CONDUCTIVITY μMHOS CM.		3750										
pH		6.7										
HARDNESS ($CaCO_3$)		1250										
ALKALINITY ($CaCO_3$)		320										
CHLORIDES (Cl)		784										
SULPHATES (SO_4)		500										
PHOSPHOROUS AS P	Total	4.3										
	Soluble	-										
NITROGEN (N)	Total Kjeldahl	6.0										
	Free Ammonia	.3										
	Nitrite	.01										
	Nitrate	.1										
METALS	Potassium (K)	23										
	Magnesium (Mg)	124										
	Calcium (Ca)	296										
	Sodium (Na)	475										
	Iron (Fe)	300										
Phenol		-										
BOD		30										
Alkalinity		894										

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

SURFACE WATER QUALITY ANALYSES

ONTARIO MINISTRY OF THE ENVIRONMENT

PROVINCIAL WATER QUALITY OBJECTIVES [1]

and

DRINKING WATER QUALITY CRITERIA [2] FOR

THE SUBSTANCES ANALYZED

SUBSTANCE	CONCENTRATION
pH	6.5-8.5 [1]
Dissolved Oxygen (DO)	4 mg/L (minimum) [1] dependent on temperature
Chloride (Cl)	250 mg/L [2]
Sulphate (SO_4)	250 mg/L [2]
Total Phosphorous (P)	0.3 mg/L [1]
Free Ammonia (N)	dependent on pH and Temperature
Nitrate (N)	10 mg/L [2]
Iron (Fe)	0.3 mg/L [2]
Phenols	0.001 mg/L [2]

PROJECT 80-96-B

TABLE 7 SHEET 1

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS SW 1 - FALCON CREEK (UPSTREAM)

PROPERTY		Apr.4 1979	May 2 1979	June 4 1979	Nov.7 1979	Dec.6 1979	Jan.17 1980	Apr.18 1980	Feb.26 1981	Apr.18 1981	May 21 1981	Oct.20 1981
CONDUCTIVITY μMHOS/CM		300	500	540	799	740	490	450	423	630	700	840
pH									8.0	-	-	7.9
HARDNESS ($CaCO_3$)									203	295	352	398
COD									<10	10	13	18
CHLORIDES (Cl)									38	44	37	49
SULPHATES (SO_4)									45	60	85	96
PHOSPHOROUS AS P	Total								.04	.10	.04	.36
	Soluble								<.02	<.02	<.02	.16
NITROGEN (N)	Total Kjeldahl								.4	.4	.6	.4
	Free Ammonia								<.1	<.1	<.1	<.1
	Nitrite								<.01	.01	<.1	<.01
	Nitrate								.5	<.1	<.1	.2
METALS	Potassium (K)				5.4	3.8	2.2	2.4				5.0
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)											32
	Iron (Fe)				2.0	.2	1.4	0.5	.17	.08	.05	2.3
Phenol (ppb)					<1	<1	4	1	<1	1	1	-
BOD					2.5	0.6	0.8	3.0	<.2	.6	.6	2.0
DOC or Alkalinity *					9.4	4.6	2.7	3.2				322*

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 7 SHEET

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE

REMARKS SW1 - FALCON CREEK (upstream)

PROPERTY		Nov.24 1981										1981 Mean
CONDUCTIVITY µMHOS CM		560										630.6
pH		8.2										8.0
HARDNESS ($CaCO_3$)		277										305
ALKALINITY ($CaCO_3$)		214										268
CHLORIDES (Cl)		70										47.0
SULPHATES (SO_4)		56										68.4
PHOSPHOROUS AS P	Total	.10										.13
	Soluble	<.02										.05
NITROGEN (N)	Total Kjeldahl	.6										.48
	Free Ammonia	<.1										<.1
	Nitrite	.01										<.01
	Nitrate	1.0										.38
METALS	Potassium (K)	2.4										3.7
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)	18.5										25.3
	Iron (Fe)	1.4										.8
Phenol		-										<1
BOD		.4										.8
COD		30										16.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 7 SHEET 2

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS SW 2 FALCON CREEK

PROPERTY		Feb. 1981	Apr.8 1981	May 21 1981	Oct.20 1981	Nov.23 1981						1981 Mean
CONDUCTIVITY µMHOS CM		454	655	660	740	600						621.8
pH		7.9	-	-	8.2	8.3						8.1
HARDNESS ($CaCO_3$)		212	303	340	350	299						300.8
COD		14	40	40	10	20						24.8
CHLORIDES (Cl)		36	44	33	40	28						36.2
SULPHATES (SO_4)		50	62	69	70	62						62.6
PHOSPHOROUS AS P	Total	.04	.04	.04	.40	.06						.12
	Soluble	.02	.02	.02	-	.02						.02
NITROGEN (N)	Total Kjeldahl	.4	.2	.6	.6	.4						.44
	Free Ammonia	.1	.1	.1	.1	.1						.1
	Nitrite	.01	.01	.01	.01	.01						.01
	Nitrate	.5	.1	.1	.4	.8						.38
METALS	Potassium (K)				4.4	3.0						3.7
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)				26	19.5						22.8
	Iron (Fe)	.21	.12	.13	.42	.34						.24
Phenol (ppb)		1	1	1	-	-						1
BOD		.8	3.5	1.0	.8	.6						1.3
Alkalinity					284	234						259

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 7 SHEET 3

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS SW 3 FALCON CREEK (DOWNSTREAM)

PROPERTY		Apr.4 1979	May 2 1979	June 4 1979	Nov.7 1979	Dec.6 1979	Jan.17 1980	Apr.18 1980	Feb.26 1981	Apr.8 1981	May 21 1981	Oct.20 1981
CONDUCTIVITY μMHOS/CM		540	630	690	970	820	580	496	492	760	600	705
pH		7.9	8.0	8.4					8.0			8.2
HARDNESS ($CaCO_3$)		254	314	351					251	362	324	330
ALKALINITY ($CaCO_3$)		185	245									267
CHLORIDES (Cl)		35	35	28					34	46	34	41
SULPHATES (SO_4)		53		61					65	84	55	61
PHOSPHOROUS AS P	Total								.04	.04	.04	.32
	Soluble								<.02	<.02	<.02	-
NITROGEN (N)	Total Kjeldahl	0.6		0.4					.4	.4	.4	.6
	Free Ammonia								<.1	<.1	<.1	<.1
	Nitrite								.01	0.1	<.01	<.01
	Nitrate								.4	<.1	<.1	.6
METALS	Potassium (K)			3.3	7.4	3.9	2.9	2.7				3.2
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)	18		23								25
	Iron (Fe)	.95	0.40	0.27	1.20	.95	1.4	.7	.7	.25	.13	.24
Phenol (ppb)		<1	1.0		<1	<1	4	1	<1	<1	<1	-
BOD		0.6		1.40	2.5	0.8	0.6	2.5	.8	.8	.4	.8
DOC or *(COD)					10.2	4.6	2.2	4.4	*10	*12	*11	*18

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

PROJECT 80-96-B

TABLE 2 SHEET 4

WATER ANALYSIS RESULTS

LOCATION BURLINGTON LANDFILL SITE REMARKS SW3 FALCON CREEK (Downstream)

PROPERTY		Nov.24 1981										1981 Mean
CONDUCTIVITY μMHOS CM		620										635
pH		8.3										8.2
HARDNESS ($CaCO_3$)		310										315
ALKALINITY ($CaCO_3$)		240										253
CHLORIDES (Cl)		46										40.2
SULPHATES (SO_4)		67										66.4
PHOSPHOROUS AS P	Total	.06										0.10
	Soluble	<.02										<.02
NITROGEN (N)	Total Kjeldahl	.4										.44
	Free Ammonia	<.1										<.1
	Nitrite	.01										.01
	Nitrate	.7										.38
METALS	Potassium (K)	3.0										3.1
	Magnesium (Mg)											
	Calcium (Ca)											
	Sodium (Na)	20										22.5
	Iron (Fe)	.65										.39
Phenol		-										<1
BOD		.4										.6
COD		10										12.2

NOTE: concentrations in p.p.m. unless otherwise noted.

Gartner Lee Associates Limited

SURFACE WATER BACTERIOLOGICAL ANALYSES

SURFACE WATER

BACTERIOLOGICAL ANALYSES (counts/100 ml)

FALCON CREEK

TABLE: 8

Station	Date	Total Coliforms	Coliform Background	Fecal Coliform	Fecal Strep	Pseudomonas Aeruginosa	Pseudomonas Background
SW1	Feb.26/81	280	1900	A20	120	<10	<10
	Apr.18/81	A50	400	<10	<10	<4	<4
	May21/81	1300	5400	A10	8	<4	<4
	Oct.20/81	2000	31,000	A10	390	<10	<10
	Nov.24/81	4500	12,000	950	420	4	<4
GEOMETRIC MEAN		696	4,333	44	69	<10	<10
SW2	Feb.26/81	300	1250	<10	A40	<10	<10
	Apr.18/81	A220	4400	A10	<10	<4	<4
	May 21/81	A690	12,000	A10	32	<4	<4
	Oct.20/81	1500	32,000	A90	1042	4	<4
	Nov.24/81	3200	10,000	470	150	<4	<4
GEOMETRIC MEAN		738	7,327	34	72	<10	<10
SW3	Feb.26/81	1,600	4,000	<10	A40	<10	<10
	Apr.18/81	A420	4,100	<10	<10	<4	<4
	May 21/81	1300	10,900	A70	32	<4	<4
	Oct.20/81	10,900	89,000	A90	1040	<4	<4
	Nov.24/81	4,200	14,000	230	150	<4	<4
GEOMETRIC MEAN		2,091	11,737	43	72	<10	<10